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MAYORS' CONFERENCE ON PUBLIC UTILITIES.

The conference of American mayors, which was held in Philadelphia last week to discuss the subject of public utilities, was a meeting of much importance, both to municipal officials and to utility corporations. It is of importance to the latter in disclosing the general sentiment towards them of the men who are leaders of public opinion in their respective communities. It was of importance to the city officials as a step in establishing co-operation between them in the handling of the utility matters which are continually arising for settlement.

Places upon the program were divided mainly between city officials, public service commissioners, and spokesmen for utility corporations, although the latter had a rather small part in the proceedings. The color of the conference was decidedly radical, as it was the element which is most extreme in its ideas which had the most to say. There was evident, however, an undercurrent of opinion among the less expressive representatives of the city governments which was more conservative in character and was not disposed to advocate extremes in the attitude of the municipalities toward the utility corporations. The representatives of the corporations were few in number, which gave rise to the complaint that they had not been adequately treated in the preparation of the program, and had not received fair treatment at the hands of the mouthpieces of radicalism.

That many city officials are satisfied with their relations with the utility corporations, and are ready to deal with them fairly, found expression in several of the addresses, notably those of the Philadelphia Director of City Transit, and city representatives from Huntington, W. Va., and Easton, Pa. The conversation of many others showed them to have similar attitudes, although this element did not take an active part in the proceedings.

The principal outcome of the conference will be the establishment of a utilities bureau, which shall be at the service of municipalities and act as a national agency through which cities may co-operate in exchanging data and experiences and obtaining information which they will be willing to rely upon in their dealings with utility companies. This will be a great assistance to city officials, who are seldom in office long enough to have much experience with utility problems, and whose attitude is frequently that of mere antagonism to the proposals of utility corporations. The as-

sistance of such a bureau should also make it easier for the utilities to deal with city officials, because the latter can get information from an independent source, which they are often unwilling to accept from a corporation because distrustful of its reliability. Dealings with officials well advised and correctly informed will be much more satisfactory than dealing with those who are ignorant of the real problems involved.

MUNICIPAL OWNERSHIP OF UTILITIES.

While much sentiment in favor of municipal ownership was expressed in the conference of mayors, not only by the city executives, but also by public service commissioners and others, it was quite evident that this sentiment was not general among the delegates to the conference. Many of them came from cities which had experimented with this condition to their sorrow, and did not care for any more of it. It was significant that in the recommendations brought in by the committee, and adopted by the conference, there was no declaration in favor of municipal ownership, but merely one that municipalities should be given the power to own their public utilities when they desire to do so. The question was squarely put by Mayor Newton D. Baker, of Cleveland, in his address, when he said that municipal ownership is a question of economic policy, not to be followed universally, but only adopted where conditions are expedient for it. Where a united public sentiment is not back of the movement, and ready to insist that competent men be placed permanently in control of the management, with elimination from partisan politics, it is doomed to failure from every point of view. Such projects as the Sanitary District of Chicago can never give satisfactory results until their management is taken out of politics. The few examples of satisfactory and efficient municipal operation are in cases where this has been done, and unless there is a strong public sentiment to back and support this policy, one can never know when a political upheaval will result in the ousting of competent men, who would be succeeded by political appointees having little interest in efficient operation. The lack of an assured tenure of office is one of the principal obstacles in obtaining competent men.

The general sentiment expressed, however, is undoubtedly favorable to the ultimate adoption of public ownership in all instances. This sentiment is evidently due to circumstances and causes which were in operation prior to the general adoption of state regulation of utility corporations. To what extent this sentiment, so widely held at present, will be modified by the development and extension of state regulation, time only can tell. It seems certain, however, that the advantages already apparent through state regulation will lessen the demand for municipal ownership and remove many of the arguments which its proponents have heretofore depended upon to support their cause. Local conditions, however, usually have more to do with local opinion than have national tendencies, and the demand for municipal ownership in different communities will undoubtedly depend very largely upon the attitude of the utility corporations which have been serving them in the past. Where this attitude is governed by an intelligent public policy, which includes publicity as to its operations, the intention and ability to give good service, and a willingness to adjust complaints, there is little danger of a movement for supplanting the private utility to gain much headway. The recent vote taken in Dayton, O., indicates that the public will usually prefer to retain the services of a company which has treated it well and has not left the community in ignorance of what it is really doing and endeavoring to accomplish.

LONDON'S LESSON IN ILLUMINATION.

Mention was made in the issue of October 24 of the regulations which had been put in force in London to cut down the outdoor illumination and especially the glare in the sky and the systematic series of street lights, which would enable the pilot of an air craft to discover his bearings. While the natural result of such restrictions was to make the streets of the city a gloomy labyrinth of dark thoroughfares, it seems to be having some good results in cultivating ability to apply the principles of illuminating engineering. Shopkeepers are studying how to illuminate their windows and the goods displayed without throwing the light into the street—the very thing which should have been aimed at in the first place. And incidentally this will probably obviate the common malpractice of having the lamps themselves visible from the street. This is but one illustration of how the necessity for eliminating the flux of light in non-useful directions will bring engineering talent to bear to direct it usefully. Street lighting furnishes another. When reflectors are provided for all street lamps so as to direct their flux downwards it will not be necessary to extinguish them to prevent upward flux.

Another effect of the regulations is to focus public attention upon the value of modern illuminants in public lighting. Not only is there a value in street lighting in the safety it affords from accidents and from criminals, and the convenience it offers in the general ability to see, but there is a psychological value owing to the fact that the banishment of gloom in the physical sense contributes to the banishment of a similar state of mind. This is especially important when the spirits of the population are already depressed by the horrors of an existing war whose scene of action is only about 100 miles away.

Let us hope that the temporary twilight of London's nights will teach her valuable lessons in avoiding eye-strain, in properly using artificial light and in appreciating the value of good street lighting.

SERVING CUSTOMERS IN GROUPS.

Central-station service is fundamentally the supplying of electricity to groups of customers within economic range of various generating plants, substations, mains and feeders, and at first sight it seems a bit superfluous to bring up the point of group supply within existing systems as a line of development which has not reached anything like its maximum. This is the case, however, in both power and lighting fields. Full recognition of the classification of customers by groups has been given in many systems of rates, but these groups are as a rule scattered units assembled only in statistical analyses and in the very real demand which they superimpose at a given period upon the generating plant. Passing from these we may consider the commercial group as a desirable consumer of service, with special reference to those within a closely confined geographical area.

Power supply to factories in a given neighborhood is usually carried out on a piecemeal basis. Service should be installed wherever a profitable contract can be arranged and no criticism can fairly be levelled against this practice. There are occasions, however, where several factories may advantageously be approached at once with the idea of providing a comprehensive group installation. The procedure calls for a comprehensive power survey, with the usual comparative estimates of operating cost by existing and central-station supplies, accompanied by conferences with the executives of the several plants in joint session with the power engineers of the electric service company, and perhaps also with wiring contractors, in cases where substantial savings appear by the design of a centralized distribution system.

The problem of supplying such a group of power users with the minimum possible investment in wiring, transformer and switching equipment is a very interesting one. It should be obvious that in a great many such cases desirable economies in first cost may be effected by good engineering. In one case it may be best to provide a centralized step-down transformer station for the entire group, cutting down the investment in reserve capacity which would be required if each concern had independent transformers and also shortening the low-tension feeder runs to different load centers; in another instance where the group method of driving is found advisable in several manufacturing establishments under a single roof, it may be possible to rearrange shafting and belting so as to cut down the initial outlay in motors; and again, where underground feeds are required, the planning of the work on a broad basis may accomplish much in reducing excavation costs, arranging for joint use of conduits, and in general providing a thoroughly reliable and efficient local system.

In the lighting field, the serving of customers in groups along the lines in mind involves a comprehensive study of illuminating possibilities in adjoining and adjacent establishments. Excellent progress has already been made here in connection with the substitution of large transformers for the numerous small, individual units formerly employed in residential and store service. The opportunity here is more in the direction of getting the owners or lessees of the various premises to agree upon a modernized installation at the same time. We believe that it can be done, for it is much like the problem, so often successfully solved, of securing the co-operation of merchants in a given street in a scheme of display lighting. As things now are, there are innumerable blocks in our cities where adjoining lighting installations are inharmonious, behind the times and frequently injurious to one another when viewed from without. Beside a beautiful installation of semi-indirect lighting one finds a concern using gas mantle lamps, while very likely the next man down the street on the same side may be using inclosed arcs. "No man liveth to himself alone," and here is a field in which some exceedingly good work can be done in the years to come. Appeals to local pride, practical suggestions as to methods of making a given block the best lighted section of a given street, possible economies in local installations and their operating cost through the purchase of supplies and remodeling of wiring on a single comprehensive order, followed by the use of equipment giving more light for the previous expenditure—these and other considerations may be turned to account.

Anyone who realizes the progress which has been made in educating the customer to appreciate modern high-class fixtures and their resulting illumination within the past five years will not despair of obtaining something like the same results on the block scale.

THE RETURN OF PROSPERITY.

Numerous evidences are at hand that the financial and commercial depression of the last few months has passed its low ebb and that business in this country is again on the up grade. Among these evidences are the reopening of mills and factories, recovery in exports, reduction of interest rates to nearer normal, inauguration of large engineering projects, resumption of building, etc. A factor of great importance was the opening on November 16 of the federal reserve banks, with the release of considerable capital formerly tied up in bank reserves; this has already had a salutary effect in making money easier and facilitating the financing of new construction and improvement projects and the development of foreign trade. The conclusion of business legislation has removed the last cause for psychological trepidation on the part of business men. The November elections give no cause for anticipating radical changes in public policy. Readjustment to war conditions is being rapidly effected.

The removal of the causes of depression is producing a gradual revival of general business that is being reflected in electrical lines. Mention is made in another part of this issue of the letting of a $2,000,000 initial contract for electrical equipment required by the extensive electrification of the mountain division of a transcontinental railway. The recovery of the electrical foreign trade as shown by the September export report in this issue is also significant.

New York Section of the Electric Vehicle Association.

The regular meeting of the New York Section of the Electric Vehicle Association of America was held at the auditorium of the Edison Company, New York City, on the evening of Tuesday, November 17. The principal address of the evening was made by R. McAllister Lloyd, who spoke extemporaneously on the influence of the pioneer spirit in electric vehicle progress. The business has seen three stages of development. In 1886 the storage battery companies needed an outlet as they could not sell enough batteries to the street railways. Patent litigation stopped all progress until 1894, when the second stage set in, owing to the demand of the public for electric vehicles. Electric trucks appeared in 1901, but they were not much of a success until 1908. At that time a new period of influence, owing to the cooperation of central stations, began. The present era is showing the results of cooperative work of the Electric Vehicle Association of America.

The automobile race at Providence in 1896, when an electric vehicle beat out all gas-car entrants, was described by Mr. Fenner, and Mr. Buck related a story of how J. M. Hill had painted some Pope electrics a brilliant plaid and hooked on a golf bag as a selling proposition. Mr. Buck said that we were still in the pioneer stage as far as selling was concerned, as the salesmen usually laid too much stress upon the superiority of the electric over the gas car. This is wrong, for the salesmen should take it for granted that the electric is a success.

Others participating in the discussion were Messrs. Phillips, Carle, Anderson and Andrews. A. J. Marshall, executive secretary of the Association, reported an attendance of over 500 at the recent Philadelphia convention. D. F. Tobias, secretary of the New York Section, announced the present membership as nearly 1,000.

Electric Lighting as Civilization Factor to Be Discussed by Mr. Doane.

A joint meeting of the Electrical Section, Western Society of Engineers, and the Chicago Sections of the American Institute of Electrical Engineers and of the Illuminating Engineering Society will be held at the rooms of the Western Society of Engineers, Monadnock Block, Chicago, on Tuesday, November 24, at 7:30 p. m. S. E. Doane, chief engineer of the National Lamp Works of General Electric Company, will make an address on "Electric Lighting as a Factor in Civilization."

Electrical Exports for September.

The monthly summary of the foreign commerce of the United States has been issued for September by the Bureau of Foreign and Domestic Commerce, Washington, D. C. From this are obtained the following facts regarding the electrical exports.

A partial recovery from the severe financial and commercial shock experienced in August is noticeable in the figures for September. Adjustment to war conditions is shown by a gain of over a half million dollars in the electrical export total of September over that of the preceding month. Whereas the August total was but 45 per cent of that of the corresponding month in 1913, the September total is nearly 69 per cent of that of September last year.

For the four classes for which numbers of articles exported are given in the government reports, there were shipped in September the following: electric fans, 1,502; arc lamps, 60; carbon-filament lamps, 69,795; metal-filament lamps, 150,731.

The values of the various classes of electrical shipments for September and for the corresponding month of a year ago are given in the following table.

Articles	Sept., 1914	Sept., 1913
Batteries	$ 38,425	$ 65,332
Dynamos or generators	119,756	161,400
Fans	18,029	64,901
Insulated wire and cables	91,375	213,094
Interior wiring supplies, etc. (including fixtures)	34,149	70,777
Lamps—		
Arc	1,472	3,835
Carbon-filament	9,960	29,944
Metal filament	30,988	20,235
Meters and other measuring instruments	14,375	.....
Motors	315,115	491,473
Static transformers	26,871	129,486
Telegraph instruments (including wireless apparatus)	3,791	15,164
Telephones	158,922	196,140
All other	685,240	792,473
Total	$1,548,468	$2,254,254

Hydraulic Features of Coon Rapids Hydroelectric Plant.

At a meeting of the Western Society of Engineers, held on November 16, in Chicago, J. W. Link presented an illustrated paper entitled "The Coon Rapids Low-Head Hydroelectric Development on the Mississippi River Near Minneapolis, Minn." This paper dealt principally with the dam and other hydraulic features of the plant. The construction work was described in detail. The plant is to have a total generating capacity of 15,000 horsepower in seven vertical waterwheel units, of which five have been installed.

Minneapolis Jovians Elect Officers.

At the first fall meeting of the Jovian League of Minneapolis the following officers were elected for the year: W. T. White, first tribune; C. C. Curry, second tribune; H. E. Brillhart, secretary; R. L. Willis, treasurer.

Chicago, Milwaukee & Puget Sound Railway Lets $2,000,000 Initial Equipment Contract for Extensive Electrification Project.

An important omen that the dawn of relief from financial depression is at hand is the announcement made public on November 17 that the Chicago, Milwaukee & Puget Sound Railway Company, a subsidiary of the Chicago, Milwaukee & St. Paul system, is planning to expend $13,000,000 within the next four years on the electrification of its main line in the Rocky Mountain district and that the initial contract for over $2,000,000 of the required electrical equipment has been let to the General Electric Company. The first mention of this project was made early last year (see ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of January 11, 1913), when authority was granted by the Secretary of the Interior for the crossing of government lands by electric transmission lines that will bring power from the hydroelectric plant at Great Falls, Mont., to various points along the electrified railroad line. Financial conditions have delayed the project, but active work is to be begun immediately.

This project involves the most extensive trunk-line railroad electrification as yet proposed. It covers the 140 miles of main line between Harlowton, Mont., and Avery, Idaho, with an additional 10 or more miles of sidings. In announcing the beginning of active work on this undertaking, C. A. Goodnow, assistant to the president of the Chicago, Milwaukee & St. Paul Railroad, said: "It is the most progressive step yet taken toward general electrification by any American railroad, and undoubtedly foreshadows the electrification of the entire line from Harlowton to the Pacific Coast, a main line distance of 865 miles, including the line to Tacoma.

"It is proposed to haul freight trains of 2,500 tons at a speed of from 15 to 18 miles an hour and passenger trains at a speed of from 25 to 30 miles an hour on a 2-per-cent incline. We have contracted with the General Electric Company for a powerful, especially designed type of electric locomotive for developing this speed.

"The proposed electrification crosses three separate mountain ranges, the Bitter Root, the Rocky, and the Belt Mountains, all within the territory known as the Continental Divide, with many miles of 0.3 and 0.6-per-cent gradients between the ranges.

"We have entered into long-time contracts with the Montana Power Company and the Thompson Falls Power Company for the electrical energy necessary to perform these services."

Electricity in Steam Railroad Service.

The accompanying data treat of the use of electricity in steam railroad service, with particular reference to the electrical operation of cranes, hoists and turntables. The information is taken from the report of the Committee on Shop Practice, of the Association of Railway Electrical Engineers.

The adoption of alternating current for power in railroad shops has necessitated the application of alternating-current motors to crane and hoist service in many cases, but we find a very strong sentiment in favor of direct-current motors and several railway electrical engineers have predicted a general return to direct-current motors for all cranes and hoists eventually. This is due not only to the lower maintenance costs of direct-current motors, but also to the increasing use of dynamic braking and the possibility of using it as a means of returning energy to the line when lowering loads.

The most interesting development in connection with transfers and turntables is the adoption of tractors instead of mounting the motors on the platform direct. Here also alternating-current motors are sometimes used, but the greater preference is still for direct-current motors.

In general, we find series-wound direct-current motors, or alternating-current motors with series characteristics, used for all of these installations, but also find some shops using compound-wound direct-current motors.

Electrically Operated Drum Hoisting Equipment as Found in Railway Installations.

Cranes.

The general class of apparatus known as "Cranes" is divided into two classes, traveling and stationary, both of which must perform the three operations of raising, moving and lowering loads of various kinds. Since stationary cranes partake so nearly of the qualities of "Hoists," this article will be limited to cranes of the overhead or travelling type.

The best modern practice in crane design and operation dictates the use of three motors, each independent and with separate functions. These are for hoisting the load, propelling the crane bridge along its runway and for moving the trolley or hoisting carriage across the crane body or bridge.

The hoisting motor is the largest on the crane and must be capable of raising or lowering objects of any weight up to the capacity of the crane. It must be able to do this at the highest practical speed, and at speeds which may be varied to suit the load. When two trolleys are mounted on a single bridge, they are each of them usually of about one-half the total capacity of the crane and should be equipped with motors to correspond.

The bridge motor is for moving the crane along its runways or track, and must be of sufficient capacity to accelerate both the crane and its load as well as to move them at the desired speed. It need not, therefore, be so large as the hoisting motor.

The trolley motor is merely for moving the hoisting carriage or trolley back and forth across the bridge. It is the smallest of the three motors on the crane but must be of sufficient capacity to accelerate both the trolley and its load.

In order to insure the highest efficiency, each motor on the crane must be capable of operating at slow positive speeds when the crane is handling heavy loads, and at relatively high speeds when handling smaller loads. The series-wound, direct-current motor possesses those inherent character-

istics which make it ideal for the requirements of crane service, and we find a tendency to return to direct-current motors in several shops where alternating-current motors have been tried for cranes and hoists.

In shops where alternating current only is available, wound-rotor alternating-current motors are used because they possess many of the characteristics of series-wound direct-current motors. This type of motor is built with slip-rings on the armature or rotor so resistance may be inserted in series with the armature or secondary to vary the speed. It can thus be made to handle heavy loads at low speeds with resistance in, or run at practically synchronous speed for handling light loads. Induction motors with squirrel-cage rotors are sometimes used because the torque or pull increases as the speed decreases. They tend to run at constant, synchronous speed on light loads and to slip or slow down under heavy loads, thus being practical for crane service.

The service requirements are such that crane motors must have starting torque, but also permits the use of motors rated on an intermittent load basis, so it has become customary for most manufacturers to use motors which are too small for the work.

Controllers for crane motors are of two types, drum and disk. The drum type is preferred by most engineers because of its simplicity, ease of repair, interchangeability of parts, magnetic blow-out and being inclosed. It is of the same type as the ones used on street cars, the service is similar and most operators seem to prefer the horizontal rotating motion of the handle. Controllers of the radial arm and face plate or disk type are used on a large number of cranes, however, with entire success.

Since cranes with capacities as great as 120 tons and more have been installed, there is a preference for automatic controllers and self-starters in order to relieve the operator of extreme responsibility by providing against too rapid operation and possible danger to load and workmen. While it is true that automatic control is most valuable for cranes of the larger sizes, it is also very valuable for smaller ones and could be adopted on all but the very smallest sizes to good advantage.

Another feature of importance for direct-current cranes is the use of controllers arranged to allow dynamic braking for the hoist motors. This facilitates stopping and gives the operator more accurate and positive control over the load handled, and also makes it possible to return some energy to the line because the motor runs as a generator during the braking period. The latter feature is only practicable, however, when the hoisting and lowering are done through considerable distances, so has found very little application in steam railroading shops. The energy generated by dynamic braking is usually dissipated in the form of heat through resistances.

Several railroads have adopted dynamic braking quite generally and they report reductions of not less than 50 per cent in maintenance costs as compared to mechanical brakes. Among the advantages of dynamic braking are the practical absence of wearing parts, ease of application, accuracy and certainty of control and simplicity. All that is needed is a suitable controller with resistances, and the contacts on the controller are the only parts subject to renewal. The braking effect can be accurately adjusted over a wide range by varying the armature current or field strength by means of suitable resistances.

The current generated tends to heat the motor, of course, so must be considered when selecting motors for this service. Dynamic braking is not used to stop motors, but merely to slow

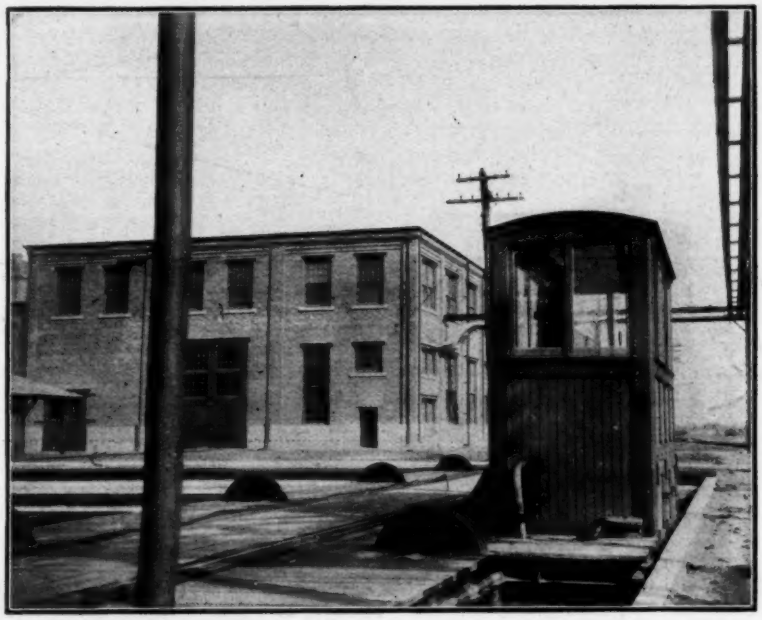
Coal-Handling Crane in Railway Yards.

Crane for Handling Material in Repair Yard.

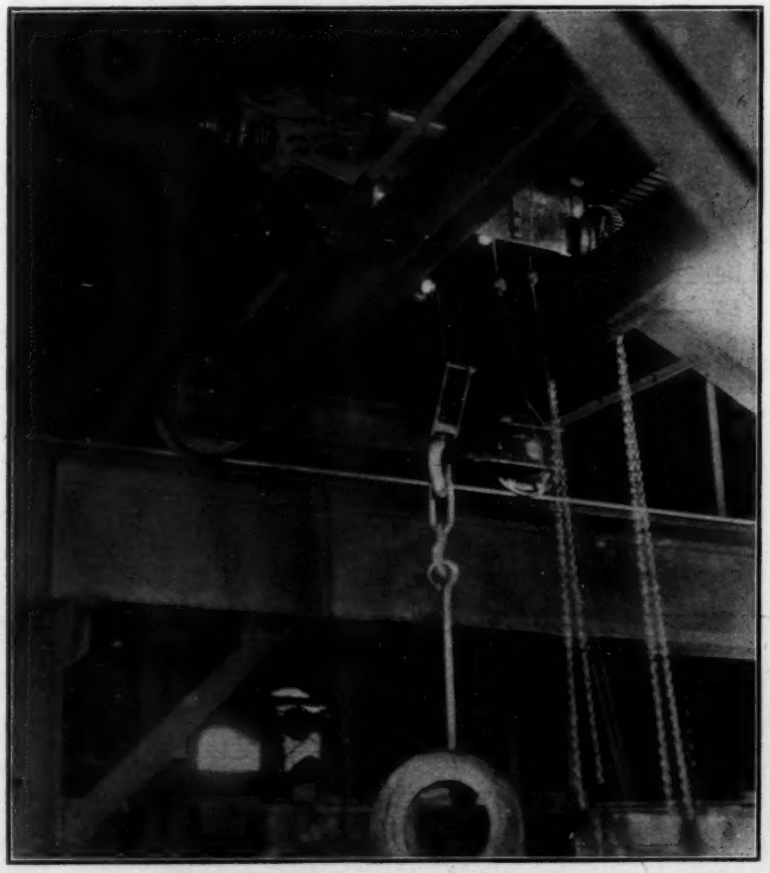
them down, because the braking action decreases with the speed the same as the output of a generator is reduced with the speed. The final stopping must be done with a mechanical or electrical brake of some kind. Experience also shows that armature troubles are reduced instead of increased by dynamic braking.

When mechanical brakes only are used for lowering loads, the brake is usually controlled by an electro-magnet connected in series with the motor. When no current flows the brake is set, but when the motor is working the magnet releases the brake and holds it open until the current falls to a predetermined minimum. Then the brake is allowed to act and help hold the load, its effect being regulated by the starting resistance. The series band brake seems preferable for cranes because repairs are less costly and easier to make than with disk brakes. Extra bands with new liners can be kept on hand and put in place of worn or broken ones quickly.

With disk brakes it is necessary to take the brake apart to renew the plates, and the hubs sometimes become so worn they cause delays for expensive repairs. Another advantage claimed for band brakes is that extra armatures can have a brake wheel attached, whereas with disk brakes it is necessary to remove the entire brake in order to change an armature, even though extra hubs may be on hand. Perhaps a coupling between motor and disk brake would simplify this problem and is recommended as worth trying.



Transfer Table Operated by a 52-Horsepower Slip-Ring Motor.



Electric Hoist Used in Railway Repair Shop.

The switchboard should be located in the rear side of the operator's cab and be as simple as possible. Good practice indicates a slate panel with fused main switch, two magnetic switches, fuses for each side of each motor circuit and at least two pilot lamps. One of the magnetic switches is placed in the main circuit and the other in the circuit leading to the hoist controllers. The closing coil of the switch in the main circuit should be provided with a plug or other means for opening the switch and locking it open, thus making the crane inoperative and protecting any one working on it. The shunt or closing coil of the switch in the controller circuit should be in series with all limit switches on housing drums. Emergency stops and limit switches are of the utmost importance and should be installed on all cranes and hoists.

Current is supplied to cranes by means of either copper trolley wire or a third rail along the runway, and a trolley wheel or sliding-contact shoe mounted on the crane bridge used as a collector. When wires are used it is better to mount them above the runway to keep them away from the hook and cable sheaves, and support them about every fifteen feet with insulators. A heavy strain insulator and turnbuckle should be placed at each end of every wire, and the wires must be far enough away from all steel work to prevent contact when swinging.

When steel rails are used, as is the

tendency for cranes of 30-tons capacity and larger, they should be supported by substantial insulated brackets from the steel framing of the building. Wires running from the trolley wheel or shoe to the main switch in the cab should be well insulated and run through flexible steel conduits with suitable fittings.

Hoists.

The requirements for hoist service are very similar to those for hoisting motors and controllers on cranes. Series-wound direct-current or alternating-current motors with similar operating characteristics are used, although regenerative control or dynamic braking does not seem to have been used because of the operating conditions.

Hoists are generally used at fixed points and are usually considered as stationary devices, but the use of traveling hoists is increasing so rapidly they must be considered also. This is especially true of monorail hoists or those made to run along on the lower flanges of "I" beams or similar overhead tracks.

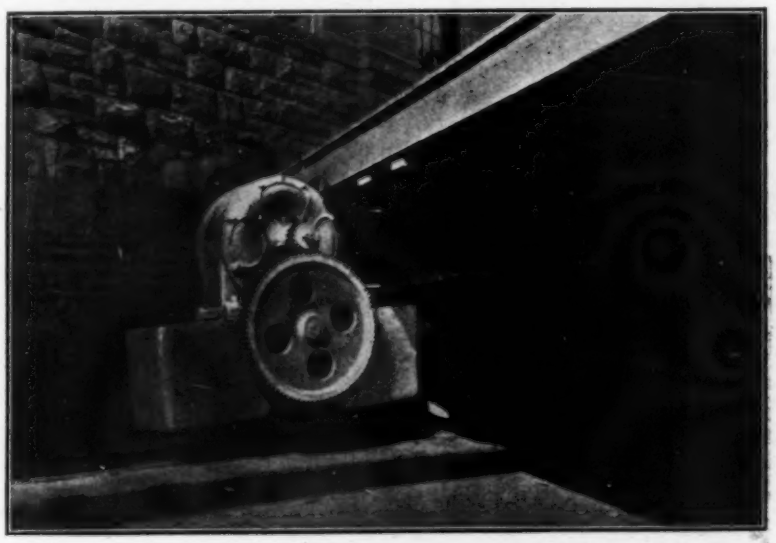
There are two types of these used in railroad shops, one consisting of a single car or trolley supporting the motor, hoisting drum, brake and gearing. It is moved along the track by hand, and is also hand operated from the floor by means of cables or small chains, leading up to the controller. This is usually of the disk type and mounted on one side of the hoist body.

The other kind is somewhat larger and more complete, consisting of a moderate size body containing the hoisting drum, motor and gearing with a cage at one end for the operator and controller. The entire monorail hoist is supported by two trucks or trolleys, each with four wheels, and with a traversing or driving motor on one of the trolleys. These trolleys are swivelled so as to take short radius curves, and the current collector or trolley wheel is generally mounted on one of them by an insulated arm.

The trolley wire or third rail is usually suspended from the "I" beam track, above the trolley, on insulated brackets. They are generally supplied with both mechanical and electric brakes, and the controllers usually allow for a dozen or more speeds. Limit switches are also provided, these being connected in series with the hoist motor and operated by paddle-shaped arms extending between the hoisting cables so as to be struck by the sheave block. Stationary electric hoists are similar to the single-trolley hoists just described excepting they have a large hook instead of the truck and wheels.

Elevators are also hoists, in the broader sense of the term, but form a distinct group and will not be reported on here more than to say that both alternating-current and direct-current motors are now used for that service. Coaling station hoists are also equipped with both alternating-current and direct-current motors, many of them having induction motors with squirrel-cage armatures and controlled by oil switches and starting compensators. Such coaling stations are usually equipped with continuance gravity bucket-type conveyors and do not start up under load.

Another interesting development is the use of remote control for hoist motors in order that the acceleration can be predetermined and taken out of the hands of the operator. This also allows the motors and their controllers to be installed close together and near the machinery, and at the same time be easily operated from distant points. It also reduces the wiring cost and can easily be made to conform to insurance requirements. The Norfolk & Western Railway uses this method of control and has adopted interpole direct-current motors as standard, using push buttons, and finds that the entire cycle of operation has been even more satisfactory than was anticipated.



Railway Turn Table Operated by Induction Motor.

Transfers and Turntables.

The service requirements of transfer tables and turntables are so similar that it is desirable to treat their equipment jointly. In both cases the service is that of accelerating a heavy load and moving it, horizontally, the service is intermittent and it requires a high starting torque.

Where direct current is available, it is considered preferable by a large number of shop men for this service, and series-wound, railway-type motors are generally used. For transfers, the motors are usually mounted in the motorman's cab or beneath the floor, with the controllers and resistances in the cab. Controllers are sometimes of the disk or face-plate type, but drum controllers seem preferable, and, in a few instances, automatic control has been tried with some success. On turntables the motors are mounted either below the floor, as in old installations, or on a tractor in more recent cases, with the controller either in a cab or on one end of the platform.

If alternating current only is available, motors with wound rotors and drum-type controllers are generally used; although high-torque induction motors have also been tried with some success. For the latter installations, motors giving full load torque at starting when thrown directly across the line, and drawing only 2.5 times full-load current, have been used. The control of such motors is by means of a double-throw switch only, thus eliminating controllers and resistances and giving a very simple type of control. These motors run up to about 25 horsepower in capacity.

The use of tractors for operating turntables is one of the most interesting of recent developments, and these have been applied to old tables as well as new ones. The tractor is a sort of electric truck or self-contained motor car, and carries the motor, controller, resistances and usually a cab for the operator. It is generally hinged to the table and may be equipped with either alternating-current or direct-current motor, as required. They may be purchased complete and ready for attaching, and the motors connect with the driving wheels through gears. In case of motor troubles the gears are slipped out of mesh handles inserted in sockets provided for the purpose and the table operated by hand until the motor has been fixed up.

On account of the rapidly increasing size and weight of cars and locomotives, transfers and turntables are being equipped with automatic starters for the motors, so as to take the acceleration entirely out of the hands of the operator. This is especially important when handling locomotives of the Mallett or Milkado types, because of possible damage to both the mechanical and electrical equipment. This automatic controller consists usually of magnetic switches in the cab, with auxiliary control handle giving three positions: Forward, Reverse and Off. This is a comparatively recent development, but presents possibilities worth considering.

The feeder wires for transfers are placed along one side of the pit, below the platform level, in some shops, and overhead in others. The preferable method is to have them overhead, either in the center on span wires or at one end on brackets, with a substantial trolley pole and wheel as a collector. Leading in wires to the controller should be carried through flexible steel conduits.

For turntables, the feeders should run underground through heavy conduits and up through iron pipe at least 1.5 inches in diameter to the center of the table. Here they fasten to the contactor rings which are stationary and attached directly to the iron pipe in most shops. The brush holders for collector brushes should be substantially attached to the turntable through a swiveling bracket to allow for rocking of the table. The underground wires should be heavily insulated and lead covered, and those from the contactor brushes to the controller should be in iron conduits. On some of the older turntables the feeders run to the center of the table overhead, but this construction is obsolete, and should be changed as rapidly as possible.

Economy of time and of operative cost are the two most important considerations in the operation of railway turn tables and transfer tables. The relative importance of these two features depends on the amount of traffic to be handled. At a very busy terminal yard the saving of time becomes the first consideration, and any device that will lessen the time required to handle engines and cars is welcomed. At the same time the careful and efficient management of modern railway systems requires that no unnecessary expense be incurred either in the first cost of apparatus or in its operating expense.

Heavy Locomotive Being Turned on an Electrically Operated Table.

The increasing frequency with which turntables are used as well as increased weight of rolling stock in many cases demand some form of operating power, and electric tractors are meeting this demand reliably, efficiently and with extreme simplicity of control and operation. These tractors combine the advantages of time saving and low operating cost, while the cost of installation is in most cases below that of any other power. By their use, delays in handling locomotives can be avoided and schedules can be more easily maintained.

The cost of operating turntables electrically is much less than by any other method. The control is so simple and easily learned that skilled help is unnecessary. Only one attendant is required and his presence is needed only while the table is in actual use. Safety devices can be installed to insure full protection from injury in case of accident or careless operation.

Approximately average operating conditions are shown in the following expense account which applies to a railway turntable where a Westinghouse electric tractor superseded hand operation. The total cost of the electrical equipment, including installation was approximately $1,500.

Annual expense of hand operation—		
Two men 24 hrs. per day at $0.15 per hour.....		$2628.00
Annual expense of motor operation—		
One man 24 hrs. per day at $0.15 per hour.....	$1314.00	
Electric energy, average $8.00 per month.....	96.00	1410.00
Annual reduction effected by use of motors		$1218.00

If to the operating expense be added a charge of 12 per cent of the cost of the electric installation, or $180, for interest and depreciation, the balance in favor of motor operation is still $1,083.

The saving in expenses is, however, a small part of the advantages accruing to the railroad company on account of the installation of the electric equipment. The great saving in time required to turn locomotives, and the generally increased amount of traffic that can be handled in a given time are of much greater importance than the saving in operating expense. The excellent showing made by the foregoing equipment resulted in the immediate installation of five more of a similar nature and the determination to supersede all hand operated tables by electric tractors at important points on the line operated by this particular company.

Jovian Electrical League of Southern California Elects Officers.

The regular weekly meeting of the Jovian Electrical League of Southern California was held at Christopher's, November 11. Ted Burger, district manager of the Western Electric Company, chairman of the day, arranged a good program with Frank Tyrrell as the principal speaker. Mr. Tyrrell made an unusually eloquent and instructive speech on the subject of "Business Ideals."

The following officers have been installed for the coming year: President, J. Harry Pieper; vice-president, H. F. Anderson; secretary-treasurer, J. O. Case. Directors, H. W. Allen, J. E. Wilson.

The league has also been notified of the following appointments: Congressman, thirteenth district, James G. Pomeroy; Statesman, California and Arizona, James N. Colkitt; First Tribune, Los Angeles, J. Harry Pieper; Second Tribune, Los Angeles, H. F. Anderson.

Commercial Practice
Management, Rates, New Business

Unique Appliance Campaign in Columbus.

A system of home demonstration with special reference to the holiday trade is being carried out by the service department of the Columbus Railway, Power & Light Company, Columbus, O., on all kinds of domestic electrical appliances. One of the effective features is for a lady representative to arrange with the hostess whereby the former may be present when a club is being entertained. There are many of these clubs, social, literary, and otherwise, which meet on an afternoon or an evening at the home of one of the members.

Consent to introduce an electrical demonstration is usually gained without trouble. The pleasing novelty of the thing is an inducement, and then there is a growing universal interest in all phases of domestic science. This is particularly true of Columbus, where the atmosphere is surcharged with the subject, as the result of the domestic course being so prominent at the State University, with its 5,000 students of both sexes located there.

The demonstration takes place in the dining-room, at the hour at which refreshments are ordinarily served. Without in any way interfering with the routine of the club the representative, while the club members are eating, stands at a near-by table and supplies a unique entertainment in the way of showing forth the uses of various electrical devices which she has had delivered to the house. This is accompanied by a running talk on electricity as a modern domestic servant, special emphasis being laid on the refining and labor-saving factors. The whole is made more effective by the demonstrator preparing one or two articles of food as she talks, and serving the same to those present. In some cases a decorative feature is also introduced in the form of one or more artistic electric lamps from the beautiful holiday line carried by the company.

All this is regarded as being the highest form of advertising, as the goods have the benefit of their natural domestic setting, and everybody is placed on an easy, familiar footing in asking questions, which would not be experienced in the usual store demonstrations. The club feature is one of a number of original ideas introduced by Mrs. A. F. Haerling, who under Superintendent Wolls, has charge of the company's display rooms and demonstrating work.

One show window of the company's offices is given over entirely to laundry appliances and vacuum cleaners. Placards invite passers-by to come in and investigate the easy-payment plan.

Utah Light and Traction Gets Unusual Construction Contract.

The Utah Light and Traction Company has recently entered into a contract with the Ulen Contracting Company for the supply of electric power which is unique in many respects. The latter company has recently been awarded a contract for the installation of approximately 70 miles of sewer pipe ranging in size from six inches to sixty inches. The total amount of this contract is in excess of $800,000, and is one of the largest jobs of its kind ever let in the Inter-mountain country. Mr. Ulen's bid was $200,000 less than the city engineer's estimate and the unsuccessful bidders freely express the opinion that the work cannot be carried to a successful completion for that figure. The progressive manner in which Mr. Ulen and his superintendents are attacking the problem indicates that he understands thoroughly the most efficient methods of handling this class of work.

The district to be covered is located in the southeast part of the city and covers a territory of approximately five square miles. Practically the entire area is heavily watered, in many localities the ground water being within two feet of the surface. One of the most serious problems in connection with the work is the unwatering of the trenches during their excavation and the location of the sewer pipe. Realizing that electricity offered the simplest solution of the pumping problem, the commercial department of the Utah Light & Traction Company immediately had a map made of the entire territory showing the location of every foot of sewer pipe to be installed and the location of its primary lines, both three-phase and single-phase, in the same territory. This was presented to Mr. Ulen's engineers and it was shown that there were three-phase primary lines not farther than two blocks from every trench and that the company had single-phase primary lines not farther than one

Electric Motor Driving Centrifugal Pump for Trench Work.

block from every trench. Design for a portable substation in which the transformers are located, an illustration of which is shown herewith, was submitted, by means of which in conjunction with heavy secondary portable cables 2,000 feet in length, motor-driven centrifical pumps could be operated along the lines of the trench for a distance of 2,000 feet on either side of the substation at a minimum cost. Upon the showing made a contract was entered into covering the entire supply of power requirements on the job. In districts where the inflow of water is heaviest these pumping outfits will be operated in batteries of from 6 to 10 units, each unit consisting of one four-inch centrifical pump direct-connected to a five-horsepower, three-phase or single-phase motor. Vertical pumps and motors will be used for the most part, although, owing to the necessity of getting the work under way quickly, some horizontal units which could be obtained from local stock are being used. Another illustration shows such a unit in operation. In some localities it will be necessary to operate these pumps 24 hours a day in order to keep the trenches dry.

Portable Substation.

In order to reduce the expense of making connections to the electric company's primary lines to a minimum, the contracting company has employed one of the electric company's regular linemen who is authorized to make taps to the primary lines. The meters are located inside the substation on the secondary side of the transformers. The revenue estimated from this job will be approximately $500 per month and the contract calls for completion in one year. The contract was negotiated by Glen B. Walker, commercial engineer for the Utah Light and Traction Company.

Louisville Company Issues Free Christmas Certificates.

In co-operation with five of the retail electrical houses of the city the Louisville (Ky.) Gas & Electric Company has just begun to make use of a "gold certificate coupon" which is good for $1 when applied to purchases of electric toasters or electric irons, several makes of each being included, when presented at any of the retail establishments referred to. The coupon, in the form and coloring of a $20 gold bank note, inclosed with a booklet discussing the character of the appliances and a circular letter, has been mailed out from the office of the company to a selected list of 20,000 of the company's electrical subscribers. The certificate bears a line to the effect that it is "A Christmas gift certificate from Louisville with the compliments of the Louisville Gas & Electric Company." It is expected that a considerable amount of business will be gained by this means, especially in view of the disinclination this season of people to spend their money for frivolous Christmas presents. The gas and electric company counts on profiting sufficiently by increase of current sold to justify its part in the proceeding.

Electric Ranges in Apartment House.

The commercial department of the Utah Light & Traction Company has just entered into a contract with Brigham Whitmore, builder of the Whitmore Apartments, for the sale to him of 26 Four "K" Simplex electric ranges to equip the 26 apartment-house building which he is just completing at the corner of First South and Second West Streets, Salt Lake City. This will be the first apartment house in Salt Lake City to be completely equipped with electric ranges. It required considerable work on the part of the company's representative to convince Mr. Whitmore that the equipment of his apartment houses with electric ranges would serve as an inducement for people to occupy them, especially in view of the fact that they are located on the west side of the city where he must depend upon working men with moderate salaries for his tenants. Several of them had already engaged apartments in the building, and one of the company's representatives went with the owner to interview these tenants and without exception they all stated that they would prefer to use electric ranges even though the cost were somewhat higher and that this would be quite an inducement for them to engage apartments. These visits quickly decided the owner to install electric ranges and indicated that the educational work which the company has done has begun to bear fruit.

Progress in White Way Campaign.

Four salesmen who have been working on the campaign of the Louisville Gas & Electric Company and the Paraydis Electric Company to put out a large number of 500-watt electric lamps on brackets have been meeting with considerable success and contracts written represent a net gain of 40 kilowatts connected load each week. Two of the solicitors, all of whom will work until the end of the year, wrote business calling for 52 unit installations last week. These are at a flat rate, $12.50 for interior installations and $13.50 for exterior.

One of the contracts, which was somewhat out of the ordinary, was written with the Inter-Southern Life Insurance Company, which owns the largest office building and the loftiest in the city. It is 22 stories in height and the top is 350 feet from the street level. The contract calls for erection of a 19-foot steel tower on the roof, to be capped with a 3,000-watt nitrogen-filled Mazda lamp. This will be visible for miles around and will constitute an advertisement of value. The company is considering a plan by which the light may be flashed on after a short interval of darkness at a given hour.

Electric Vehicle Data

Electric Vehicles in Flour-Mill Service.

We present data this week which convincingly demonstrates the economies of the electric vehicle in flour-mill service, and in a hilly locality. The data shown are taken as an average of six months' operation. The Albers Milling Company, of Portland, Ore., manufactures flour and cereals and does a wholesale business in grain, hay, flour and feed. The vehicle in question is used for delivering small orders of the above commodities to the company's customers within the city limits and usually within a radius of four or five miles. The vehicle generally has a number of orders to deliver and is required to make frequent stops. In fact, the performance in this connection averages 1.49 stops per mile, while the tonnage of the products delivered averages 0.35 ton per mile.

The vehicle in question, of Anderson manufacture, is of the type shown in the accompanying illustration. The roads traversed are for the most part paved or gravelled but there are many steep grades, all of which are successfully negotiated under all weather conditions and fully loaded.

In explanation of the data herewith, it may be stated that the machine is regularly kept in a corner of the company's warehouse, and as this space is not available for any other use, no charge is made for storage or garaging. The driver of the vehicle has sufficient time to care for batteries, make minor repairs and adjustments and wash the car when necessary. The company pays a salary sufficiently high to insure a capable man.

In connection with the data presented, the Albers Milling Company has contributed the total operating costs for a typical month, including taxes and depreciation. This report shows the following charges, in addition to driver's salary and cost of power: oil 25 cents, grease 25 cents, maintenance $25.32, tire wear 2 cents per mile, or $11.72, interest $16.93, insurance $4.60, taxes $5.00, and depreciation $33.87, or a total cost for the month of $189.24.

During the month covered by these figures the vehicle was used 24 days, making a total of 122 trips, or an average of 5.08 per day. The total mileage for the month was 586, or 24.41 miles per day. There were a total of 877 stops made, making the average per day 36.54. The total tons delivered during the month was 206.5, an average of 8.60 per day and 0.35 ton per mile.

Unit costs based on the foregoing performance during the month in question are as follows: cost per day to operate $7.88, cost per ton to deliver 0.917 cent, cost to run a mile 0.323 cent, and cost per ton-mile 0.45 cent.

The Albers Milling Company considers the electric vehicle the most satisfactory, efficient and economical type of vehicle and does not hesitate to recommend it to its contemporaries.

The advantages of the electric vehicle advanced generally by electric car advocates and borne out by the experience of the Albers Company may be summarized as follows.

Its power equipment may be provided in accordance with the daily work to be performed, and this work can be measured and recorded in advance of the selection or purchase of machines.

Any speed consistent with traffic conditions may be arranged for.

The moving mechanism is all rotary (not reciprocating).

The facility and ease of control in congested traffic districts practically assures automatic adjustment of power to the varying load and desirable changes of speed.

Skilled mechanical labor is not required for operation, so that in any change from animal to mechanical transportation the same labor may be retained.

GENERAL.

Name of Company—Albers Bros. Milling Co., Portland, Ore.
Business—Cereal Millers and Dealers in Grain, Hay, Flour and Feed.
Capacity of Vehicle—1.5 Tons.
Approximate Price—$3,382.50.
Make of Tire—Goodrich Special.
Tires—Solid.
Make of Battery—Edison.
Number of Cells—Sixty.
Date of Purchase—October 26, 1912.
Make of Vehicle—Detroit Electric.
Size of Tires—Front 34x4, Rear 36x5.
Type of Cells—A-6.

OPERATING DATA.

Average Daily Mileage—27.3.
Kilowatt-hours per Month—666.
Daily Hours in Use—10.
Days in Service, per Month—25.7.
Cost of Electric Power per Month—$19.98.
Driver's Salary per Month—$77.00.
Cost of Repairs and Renewals for Six Months—$51.86 (Not an average).

TOTAL AVERAGE MONTHLY OPERATING COST—$105.46 (6 months' average).

Electrical Construction

CUTTING ROUND HOLES THROUGH GLASS.

By H. B. Manson.

Small holes can be drilled through a plate of glass with a twist drill or with the broken end of a file, but where it is necessary to make holes of over one-fourth inch in diameter, it is difficult to form the holes by the drilling method. The method of grinding holes that is here described can be successfully used for a hole of almost any reasonable diameter. The method is particularly convenient for making the holes through the glass disks such as are used for the bushings of high-tension entrances, like that of Fig. 1. In this economical and effective type of entrance, a piece of vitrified sewer pipe is built into the wall of the station. The pipe pitches downwardly so as to form a drip and a disk of glass is cemented into the flanged end of the pipe. Through the center of this glass disk a hole is bored to provide for the admission of the high-tension conductor. The disk is held in the pipe with neat Portland cement, and the hole around the conductor where it enters the glass can also be stopped up with the same material, provided the conductor is held rigidly and will not vibrate. Unless the conductor is held rigidly by insulators on each side of the entrance, its vibration will crack the cement.

A hole can be formed in glass with the arrangement shown in Fig. 2. It is a grinding rather than a drilling operation. A hole three-eighths inch in diameter can be cut through a piece of glass one-eighth inch thick in about eight minutes with the method, which is very economical.

The grinding tool consists (Fig. 2) of a piece of copper tubing which should have an outside diameter equal to that of the hole that it is desired to cut. The wall of the tube should be at least one-thirty-second inch thick, but can be thicker. Where large holes are to be cut, the wall must be considerably thicker, so that the tube will be amply rigid. The tube should be straight and true. Its upper end is clamped in a drill chuck, and it should be driven at approximately the speed that would be used for a twist drill of the same diameter in drilling cast-iron.

The glass plate in which the hole is to be made is carefully bedded and levelled on the drill table, and is firmly clamped with wooden blocks so that it cannot move. Now the copper tube that

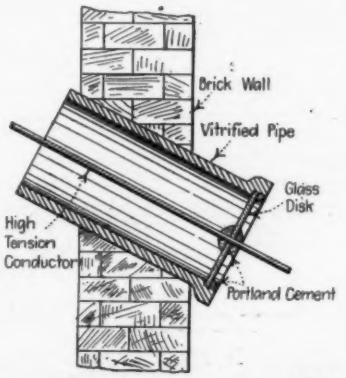


Fig. 1—Glass Disk Used for Wall Bushing.

is revolving, due to the operation of the twist-drill mechanism, is lowered against the glass, and an emulsion of fine emery and machine oil is fed under the edges of the tool where it is rotating against the glass. The tube is raised, more emery and oil is pushed under its edges, and it is lowered again. This process is repeated until the plate of glass is drilled half way through.

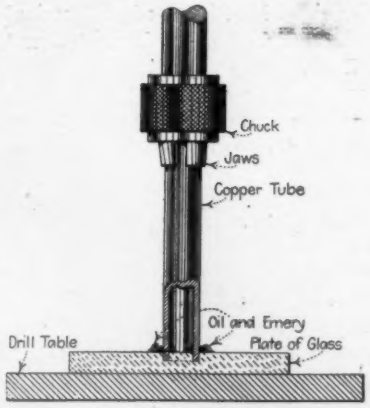


Fig. 2.—Cutting Hole in Glass With Copper Tube.

The emery imbeds in the edge of the copper tube and thereby forms a quick-cutting, circular boring tool.

After the hole has been cut half way through the glass on one side the tube is raised and the glass is reversed. The hole is then completed from the reverse side. This prevents the glass from chipping around the hole.

Copper appears to be the best metal obtainable for these tubular, glass-boring tools. Besides being so soft that the emery readily imbeds in it, it is a splendid conductor of heat, and seems to carry the heat developed by the boring rapidly away from the glass and thereby prevents cracking.

Reducing the Cost of Wiring, and Unit Prices for Wiring.

The current issue of the National Electric Light Association *Bulletin* contains several interesting items relating to the last meeting of the Committee on Wiring of Existing Buildings. The chairman of this committee is R. S. Hale, of the Edison Electric Illuminating Company of Boston. The committee is continuing its work on standardizing plugs and receptacles. A preliminary report has been adopted by the committee and it is felt that this will result in a classification of plugs and receptacles for all small devices that will curtail their use on lighting circuits. It is stated that several manufacturers have already expressed their intention of asking to have their plugs and receptacles included in this class, in some cases reducing the rating from 10 and more amperes down to six amperes, or 660 watts. While this will prevent the sale of plugs in this class for large radiators, etc., that take more than 660 watts, it is believed that it will render the sale of receptacles and plugs for the small devices more popular. Inspectors have had some reason for requiring separate circuits, switches, pilot lights, etc., for receptacles that were rated for 10 or more amperes. In the future, however, a customer who is actually using his toaster or percolator or flatiron from a socket would be allowed to change that socket to a receptacle without being required to put in a separate circuit, provided he puts in a receptacle whose plugs are clearly limited to the wattage that is allowed on lighting circuits.

The committee urges the use of unit prices for wiring jobs, particularly those that run as low as $10 and $15 each in the case of small, cheap houses, and even up to $50 or $100 jobs. It is

thought that the cost of estimating and soliciting and closing these contracts must, for the sake of the growth of the industry, be brought to a minimum. The committee proposes to collect data from a large number of companies and present these data in the form of a compilation and comparison which should encourage other companies that are not now using unit prices to adopt them, and enable companies that are using unit prices to revise them as may be necessary from time to time.

The committee is considering plans for reducing the cost of wiring. It does not intend to promote or advocate any cheap or dangerous methods, but it believes that where the factor of safety of installations in conformity with the National Electrical Code is very large, that a saving in expense can be made that will make the net result better than at present. In conformity with these ideas. after a discussion of several suggestions which are submitted to the committee, the following resolution was adopted:

"Whereas at our October 1, 1914, meeting a concentric wiring system was shown this committee by the General Electric Company:

"Whereas this system appeals to us as a means of obtaining certain business in unwired existing houses, which business cannot be obtained with any of the present existing systems now approved by the National Board of Underwriters:

"Whereas this system as shown us in its preliminary state appears to us to be entirely safe from a fire and life hazard point of view, if limited to exposed installations:

"Resolved, that the General Electric Company is hereby requested to submit the proposed concentric system to the Electrical Committee of the National Fire Protection Association for approval, with the recommendation that any existing rules which may interfere with its use be changed at the next biannual meeting."

As will be noted, the committee is in favor of this only when it is safe, but believes that such a system can be designed and installed so as to be entirely safe and practical.

The second question on which the committee took action was in regard to the use of a solid neutral, and the omission of all fuses, cutouts, etc., on the neutral of a grounded system between the generator and the lamps, and on this the committee voted, expressing its opinion in favor of such amendment, and appointed a special committee to confer with the association representative on the Code Committee, to see what action could best be taken towards accomplishing this result.

The committee is seeking information from central-station companies and others interested in the matter with regard to suggestions for changes in the National Electrical Code that would increase the safety of wiring without reducing the cost. This would include cases where a change in the rules would reduce the cost in a portion of the work without seriously reducing safety, this saving in cost then to be applied to increasing safety elsewhere. Suggestions are invited along these lines; it is particularly requested that manufacturers make suggestions which apply to types of apparatus rather than to patented articles. The committee also offers its services for consultation in cases where local inspectors are insisting on rules not in the Code that increase the cost of wiring more than is warranted by increased safety. Information is also desired with respect to any districts in which rules are disregarded without causing fire or other losses. The committee will then take up the question as to whether such rules cannot be omitted from the Code and thereby save expense in the other districts, such saving to be then applied to increasing safety.

Reducing Cost.

The National Electrical Contractors' Association has appointed a committee on reducing the cost of electrical construction. A. J. Hixon, of Boston, is chairman, and the other members of the committee are Paul H. Jaehnig, Newark, N. J., and F. M. Grant, of Cleveland, O.

The object of this committee is to collect information in reference to house wiring campaigns and unit prices.

Biennial Meeting of Electrical Committee to Consider National Code.

The biennial meeting of the Electrical Committee of the National Fire Protection Association will be held in March, 1915, in New York City, the day and place of the meeting to be announced later. As usual, the provisions of the National Electrical Code as they now exist will be considered, together with reports of all subcommittees on related subjects.

Suggestions for amendments to the Code must be specific and where a change is desired in a rule, or section of a rule, definite wording for such change must be given together with the reasons why the change is recommended, and these suggestions together with all committee reports must be in the hands of committee's secretary not later than January 15, 1915.

As heretofore, the meeting will be open to all interested and such persons will not only be welcome but are urged to be present and give the committee the advantage of their experience and advice. Ralph Sweetland, 141 Milk Street, Boston, Mass., is secretary of the Electrical Committee.

Among the Contractors.

Forty 5-lamp electric light standards, with necessary wiring, constitute a contract amounting to $3,600, that has been let to the Erner-Hopkins Company, Columbus, O., for the Fourth Street viaduct of that city. This covers the superstructure and its approaches. The standards will be of iron and will conform in design to that used by the municipality for street lighting. Another wiring contract for this viaduct has been awarded to the McKeever Electric Company, at $300.

The Sterling Electric Company, Minneapolis, Minn., has just secured the contract for building transmission lines from Sibley to Ocheyedan, Harris and Lake Park, Iowa, approximately 25 miles; also a distribution system including a White Way for each town; the contract price was $27,000. The company has also secured the contract for transmission line from Worthington to Rushmore, Minn., including distribution and White Way system, at a contract price of $10,000.

Claude H. Freed has entered into the electrical repair and supply business at Center Valley, Pa., due to the advent, shortly, of electric service to be supplied from Coopersburg.

Estimate Sheet for Contractors.

It is a common plaint among electrical contractors that the successful bidder for a piece of work is the man who forgets something in preparing his estimate. The items forgotten may be in the way of labor and materials, or incidental charges commonly called "overhead."

The technical press, supplementing the work of commercial organizations, has done much in the last five years to educate business men in the calculation of overhead costs. Among electrical men, these incidental costs are now pretty thoroughly understood. Still there is a tendency to overlook many minor items in preparing estimates for small work.

The Alameda County Electrical Development League, composed of electrical men in the cities across the bay from San Francisco, Cal., recently tackled this problem with the idea of developing a uniform method of preparing cost estimates. Many of the members represent small shops, and it was desired to have them handle their work with the same knowledge of costs that

OWNER ..... DATE .....
CONTRACTOR ..... LOCATION .....
ARCHITECT ..... ADDRESS .....

	Outlet	S. P. Sw.	3 Way	Base P.	Iron P.	Lts.	Cir.	Bells	Tel.
BASEMENT									
1st FLOOR									
2nd "									
ATTIC									
TOTAL									

QUANTITY	ARTICLE	COST		QUANTITY	ARTICLE	COST	
	Inspection				Single Plates		
	Conduit				2 Gang "		
	Condulets				3 " "		
	Condulets				4 " "		
	Service Box				S. P. Flush Sw.		
	Ground Clamps				3 Ways " "		
	" Wire				S. P. Snap "		
	Feed "				3 Ways " "		
	Service Switch				Base Plugs (Com)		
	Cutouts				Iron " "		
	"				Bells		
	"				Buzzers		
	Asbestos				Batteries		
	Cabinet Box				Bell Transformer		
	Fuses				Push Buttons		
	"				Floor Push		
	Sub. Feed Wire				Table Clamp		
	" " "				Bell Cord		
	No. 14 R. C.				" Wire		
	" 12 "				Tel. "		
	" 10 "				Speaking Tube		
	" 8 "				" " Whistle		
	2-8 in. Loom				" " Mouth Pce		
	¼ " "				" " Elbows		
	⅜ " "				Tape, Solder, Paint,		
	3 " Bushings				Pipe Straps, Etc.		
	4 " "						
	5 " "						
	6 " "						
	No. 5½ Solid Knobs						
	" " Split "						
	Outlet Boxes						
	" Plates						
	Gas Clamps						
	Loom "						
	Single Sw. Boxes				LIABILITY		
	2 Gang " "				CARTAGE		
	3 " " "				LABOR		
	4 " " "				CAR FARE		
	Spacers						

TOTAL COST .....
GROSS PROFITS .....
BID PRICE .....

Estimate Sheet for Electrical Contractors.

keeps the owners of larger shops out of bankruptcy. The object was to the interest of the smaller shops in protecting their profits as well as to all the members in maintaining a standard of figuring.

A committee spent considerable time in preparing a form that would embrace all the items entering into the average job of wiring. An analysis of this form will show that it does not apply to large work, such as office buildings. In the latter case the contractor is much more careful in preparing his figures.

The committee then received bids from several printers and was able, by placing a large order, to have the forms printed on good stock for the surprisingly low price of $2.00 per thousand. These were then distributed to the various members according to their subscriptions. To show the saving obtained, it will be interesting to note that one contractor had to pay $10 per thousand for the same forms, which he had ordered in a small quantity for personal use before the large order was placed.

The estimate sheet is shown here for the benefit of other associations who may have the same problem.

National Association of Electrical Inspectors.

THOMAS HENRY DAY, President, 59 Deerfield Avenue, Hartford, Conn.
H. S. WYNKOOP, Vice-President, Municipal Building, New York, N. Y.
WILLIAM LINCOLN SMITH, Secretary and Treasurer, Concord, Mass.
JAMES E. COLE, Representative on Electrical Committee of National Fire Protection Association, City Hall Annex, Boston, Mass.

Executive Committee
EUGENE N. DAVIS, Chairman, Brookline, Mass.

SECTION REPRESENTATIVES:
C. H. Fletcher, H. Burnes, British Columbia.
A. W. Hopkins, G. W. Perry, Western New England.
Washington Devereux, A. H. Lilley, Philadelphia.
E. N. Davis, H. A. Knight, Eastern Massachusetts.
C. A. Hannan, O. E. Smith, New York City.
C. W. Mitchell, John W. Carrell, California.

MEMBERS AT LARGE:
George L. Collison, Frank R. Daniel, James H. Fenton, F. G. Hartwell, J. E. Latta, James B. McCarthy, Thomas D. MacColl, A. A. Moffitt, R. P. Strong

"LET THE CODE DECIDE."

Secretary's Message.

The Secretary regrets to be obliged to call the attention of the members at large to the slowness with which replies to his recent communication regarding dues are being received—only about a dozen so far out of nearly a hundred. Perhaps the members do not realize how much this hampers the Secretary in carrying on his work, the sum is not large for each man, but in the aggregate it amounts to considerable. Please attend to it at once if you have not yet done so.

President Day has been engaged to give a course of five lectures on Electrical Fire Hazards, by the Insurance Institute in Hartford this fall; he is also to speak on the same subject before the electrical interests in Waterbury, Conn., as well as before the Connecticut Electrical Contractors' Association.

C. W. Mitchell, inspecting engineer of the Board of Fire Underwriters of the Pacific, and delegate member of our Executive Committee for the California Section, has been appointed by President Day to represent the National Association of Electrical Inspectors at the World's Insurance Congress to be held in San Francisco in connection with the Panama-Pacific International Exposition.

Members will please note the following changes in addresses as given in my recent membership list:

Russell G. Schoedinger, care National Carbon Company, Cleveland, O.

Joseph Hill, New York Section, 971 Kelly Street, The Bronx, New York City.

D. D. Plimley, New York Section, 1881 West Eighth Street, South Bensonhurst, Brooklyn, N. Y.

Harry H. Hornsby has left the employ of the Sprague Electric Works of the General Electric Company and I have no knowledge of his present address.

Paul S. Emrick, electrical inspector, 424 Vine Street, West LaFayette, Ind., has joined the Association as a member at large.

The Secretary regrets to announce the death, several months ago, of J. J. Gaffney, member, of Newark, N. J.

The matter appearing in this section consists of questions on the National Electrical Code, its interpretation and meaning, and questions as to whether certain methods of wiring are in accord therewith. These questions are gladly received from anyone interested, even if not a member; they should be sent to the secretary with any needed elucidating sketch. They are answered by each member of the Executive Committee according to his knowledge of what the ruling would be in his jurisdiction.

It should be understood that no pretense is made to give an authoritative interpretation of the Code. This is a voluntary association; it has representation on the Electrical Committee of the National Fire Protection Association, which prepares the Code, but it has no right, and claims no right, to give a final interpretation of anything in the Code. It is only intended to give the interpretation which seems correct to the members of the Executive Committee. No attempt is made to edit or correlate the answers from the different members of the Committee, as it is felt that the occasional difference of opinion is calculated to lead to a further study of the matter in question, further discussion and the final clearing up of obscure points.

The aim is to help toward a better understanding of the Code on the part of all; a more uniform conception of its meaning; increased precision in applying it; and harmonious action of those using it, for the common good.

Notes from the Sections.

At the recent meeting of the New York Section the membership was increased by fourteen, Vice-President Wynkoop was transferred from the list of members at large to Section membership, and the following gentlemen, all members of the municipal force of the city, were elected:

G. O. Jenney, 121 Fifty-third Street, Brooklyn; Bernhard Stern, 314 Snyder Avenue, Brooklyn; J. J. Hickman, 230 Seventh Avenue, Brooklyn; C. R. England, 230 East Thirty-fourth Street, Brooklyn; N. H. Cassidy, 1426 Greene Avenue, Brooklyn; F. M. Dobler, 6891 Thirteenth Avenue, Brooklyn; J. M. Quigley, 127 Washington Avenue, Brooklyn; F. N. M. Squires, 3308 Hull Avenue, The Bronx, New York City; George W. Regan, 118 North Seventh Avenue, Whitestone, N. Y.; Edward Quinn, 586 Second Avenue, New York City; William Goerwitz, 5000 Broadway, New York City; J. J. Quinn, 259 West 114th Street, New York City; J. F. Alexander, 30 Church Street, New York City.

The Section should now be in a very strong position and is certainly capable of supplying a large amount of valuable information to the rest of us from the fruitful field which it occupies, if it only will; as well as exerting a very healthful effect over the matter of electrical inspection at large.

The Western New England Section held its fifth bimonthly meeting on October 27 and the following report is supplied by Secretary Forsyth.

The morning session was called to order by the president, G. W. Perry, at 10:45, in the new assembly room of the Hartford Electric Light Company on Pearl Street. E. M. Baldwin and E. S. Francis, president and vice-president of the Connecticut Electrical Contractors' Association, were the guests of the Section.

At the business meeting George S. Pitt, electrical inspector for the city of Middletown, Conn., was elected a member.

A. H. Soper, inspector for the Hartford Electric Light Company, gave a short talk on meter locations in blocks and office buildings, and the proper location of service entrances in overhead work. He called attention to the fact that in wiring an old block for one customer the meter board should be planned and the service connection made large enough to care for future growth in the building. The main meter board and service owned by the owner of the building, and the meter board and meter loops for the entire block in the public part of the basement.

In the following discussion the methods of marking meter loops for identification were discussed, the general opinion being that any form of tag was unreliable and that numbering the loops with figures painted on the meter board, figures not less than three-quarters of an inch high, was the best

method. The balance of the morning was given to the discussion of Rule 15*c*, fine-print note. It was decided that where a secondary ground wire was run on the wall of a finished room it could be run in conduit. The meeting adjourned at 12:30 o'clock, to be the guests of Mr. and Mrs. T. H. Day at lunch at their home, 59 Deerfield Avenue.

After lunch several minor questions were disposed of and the guests were invited to say a few words. Mr. Baldwin stated that what the Contractors' Association wanted was better and more rigid inspection outside the present inspection districts, in order to bring up the grade of electrical work in towns which are at present without any or practically any electrical inspection. Mr. Francis explained the aims and purposes of the Contractors' Association and what it stood for and re-emphasized Mr. Baldwin's remarks on inspection.

The meeting adjourned at 4:15 p. m., after setting the place of the next meeting at Springfield, Mass., December 9, when it is expected that Mr. Day will address the Section on, "The Electrical Inspector, His Standards and Work." The Section will have as its guest, Calvin Roulet, past president (in 1905) of the Association.

The Eastern Massachusetts Section held its regular monthly meeting at the office of the Commissioner of Wires, in Boston, on Thursday, November 5, being called to order by the secretary at 2:15 p. m. In the absence of President Davis, Charles Ashby, of the Executive Committee, presided. Later Mr. Davis arrived and assumed his station.

The afternoon was given to the consideration of two proposed modifications of the Code, the first relating to a change in the wording of Rule 32*e*, and the second to a proposal to change Rule 12*b* so as to allow under certain conditions the use of cabled wire for service loops from pole line to building, provided all the conductors be of equal size and rubber-insulated. Both suggestions were, after full discussion, adopted by the Section and have been presented to the Executive Committee of the Association for approval, so that they may be presented to the Electrical Committee at the proper time.

In the discussion of the second suggestion it was brought out that a large number of services are being so installed, and working with entire satisfaction. Samples of the cable, however, were shown in which were found, for instance, two No. 6 rubber-covered conductors and one No. 8 weather-proof. It was felt that this was not suitable for many reasons for general use and accordingly the above provision was inserted.

The meeting, which was quite fully attended, adjourned at 5 p. m., subject to call during December by the Executive Committee.

A few days ago the Secretary received a letter of which the following is an abstract: "In the construction of a new brick building in our territory, solid knobs were used, contrary to rule 16*b* of the Code. Work was concealed, knob-and-tube class. We held up the installation, but were overruled by the X board, who gave the parties a certificate of inspection. Will you kindly give your interpretation of this rule and to what extent it applies."

To this the Secretary replied substantially as follows: that neither he nor this association had any power to give an authoritative ruling on such a question, but that personally his understanding of the rule was that with wire sizes of No. 8 B & S gauge or over, solid knobs could be used if the conductor were firmly tied thereto, with marlin, cord, etc., or with wire, provided the tie wire had an insulation equal to that of the tied wire; that split knobs must be used with all wires smaller than No. 8 B & S gauge except at the dead ends of runs, where solid knobs or strain insulators were placed. That the rule had no exception whatever except in those types of molding or armored construction where no knobs at all were used. Then he went on to say: "I am unable to say whether the X board is an insurance board or a municipal board; if it is the former and you are dissatisfied with the ruling your proper course is to write (stating the facts) to Mr. Ralph Sweetland, secretary of the Electrical Committee, N. F. P. A., 141 Milk Street, Boston, and request a decision of that Committee upon the facts as stated.

"If, on the other hand, the X board is a municipal authority, then it *may* be that there is some local rule which has been adopted by it according to its statutory powers, in which case it would have the force of law and supersede the Code. In this case you would have to proceed by appealing from the decision in the manner provided by the statute under which the 'Board' is organized, if there be any method provided. The varying methods in different states hardly make it possible to say more."

The Secretary has referred to this here, being in doubt whether this was intended as a question for our department question box or whether some more authoritative decision was desired; he felt it was the latter, in spite of the statement carried within the border at the head of our columns, and therefore thought it advisable to state again the proper method to pursue in such cases, trusting that the members of the Executive Committee will agree that he took the correct course.

Public Service Commissions

Conducted by William J. Norton

CALIFORNIA.

The Southern California Edison Company was authorized to issue $784,000 five-per-cent bonds due November 1, 1939. Of these bonds $266,000 may be issued at once, provided the company receives therefor not less than 86 per cent of their face value, plus accrued interest. The proceeds from the sale of this portion of the issue will be used by the company in paying promissory notes amounting to $250,000. The Commission's order provides that the remaining $518,000 face value of the bonds shall not be issued until the Commission has made a further order specifying the minimum price at which they shall be sold and the specific purposes to which the proceeds shall be applied.

COLORADO.

Commissioners Appointed. George T. Bradley has been appointed by Governor Ammons as a member of the Public Utilities Commission. The commission act became effective August 12, 1914. The two other members, Commissioner Anderson, chairman, and Commissioner Kendall, were named in Section 4 of the Act. Mr. Anderson's term expires the second Tuesday in January, 1915.

DISTRICT OF COLUMBIA.

Lieut. Col. Chester Harding, Corps

of Engineers, United States Army, has resigned from the Public Utilities Commission of the District to accept the detail as engineer of maintenance of the Panama Canal. He has been succeeded as commissioner by Major Charles W. Kutz, Corps of Engineers, United States Army, who has been elected chairman of the Commission to fill the unexpired term of Colonel Harding.

The Chesapeake and Potomac Telephone Company. Complaints were made to the Commission alleging that the company's practice in exacting a "removal charge" is unreasonable and discriminatory in that the same charge is made in a case which requires removal of the telephone equipment as in a case which requires no change in equipment on the premises of the subscribers. The company explained that the charge is made to cover the cost of a change of service rather than change of equipment and introduced evidence to show that even in a case in which no removal of telephone equipment on the premises of the subscriber is involved, it is necessary to make new connections to the switchboard from the wires as they enter the exchange building, to send a man to the premises to change the number on the telephone, and to make changes not only in the directory itself, but also in the records of all the many departments of the company. The Commission states that the present practice of the Chesapeake and Potomac Telephone Company of charging a flat rate for removals without distinction as to actual removal of telephone equipment on subscriber's premises is just and reasonable. The reasonableness of the amount charged for removals may be taken up later in connection with rate cases brought before the Commission.

INDIANA.

Vincennes Water Supply Company. A decision has been rendered adjusting the rates of the Vincennes Water Company. A block meter rate was ordered, providing a minimum charge per meter per year. All free service was ordered discontinued. The Commission placed the value of the company's plant at $325,000 which included $5,000 for working and $25,000 or practically 8 per cent of the value of the physical property for going value. A return of 7 per cent on the total value was found to be reasonable.

OHIO.

The Dayton Power and Light Company was granted authority to purchase the property of the Miami Light, Heat and Power Company; and to issue, in partial payment therefor, $159,000 of its first and refunding-mortgage five-per-cent gold bonds, to be delivered in exchange for an equal amount of the outstanding five-per-cent bonds of the Miami Light, Heat and Power Company.

The West Liberty Light and Power Company was authorized to issue its capital stock of the total value of $10,000, the proceeds to be applied in the purchase of the property of the Chester A. Hartzler electric light plant, and in the construction of additions, extensions, and improvements to its plant and system.

PENNSYLVANIA.

Erie County Electric Company. The Commission dismissed the complaint of James Thompson and M. A. Hanna and Company against the Erie County Electric Company. The complaint involved the reasonableness of rates fixed by contract for a supply of current to the petitioners for operating an Hulett ore unloading machine at Erie. The complainants alleged that the contract rates are higher than rates offered in the company's schedule to other customers receiving similar service and further stated that a competing company, Erie Lighting Company, offers a lower rate for this service.

Counsel for both parties agreed that the Commission has power to inquire into the reasonableness of the rates named in the contract and to regulate such rates, notwithstanding the fact that the contract was entered into prior to the passage of the Commission Law and this point is not discussed in the Commission's decision. The respondent has refused to cancel the contract and the Commission says: "This matter of cancellation of the contract is one that this Commission has no authority over."

The complainant contended that the electric current it received, is a part of the same current produced at the same time, in the same place, by the same generator, and at the same cost per kilowatt for production as is the current furnished to and "produced for the vast number of other power customers" of the respondent. In considering the right of the company to make a different rate for complainant's service, the Commission quotes sections of the Pennsylvania Public Service Commission Law relating to the charging of reasonable rates and to the proper classification of rates and services (Article III, Section 1 and 8). The Commission concludes that "it is evident that the classification authorized is not limited to the methods of production, distribution, and operation costs of the producer, but is authorized to be applied to 'the nature of, the use, the quantity used, the time when used, the purpose for which used. etc;' and that the 'classification' extends to the customer, his uses, requirements, etc. Under such enactment it is proper and lawful for the respondent to classify its power customers."

From the testimony it is indicated that there is "a considerable and recurring fluctuation in the current requirements at the ore dock, and as in addition, the complainant uses but a small amount of current for two to four months per year, and then a very much larger quantity (200 to 400 times as much) during the season of navigation; and also with a large variation in the quantity of current required from year to year, it is the opinion of the Commissioners that a classification covering such service, and the service rendered to the complainant, is proper and lawful." The rate charged for complainant's service is not considered unreasonably higher than the schedules with which it was compared and the petition was, accordingly, dismissed.

WISCONSIN.

The Lancaster Electric Light Company was authorized to issue $15,000 of notes for the purpose of paying for the construction of its transmission line near the city of Platteville. The notes are to be paid in 60 monthly installments of $250 each, bearing interest at the rate of seven per cent until their respective maturities.

The Gleason Telephone Company was granted authority to issue $5,000 of stock.

Chicago Jovian League.

A very impressive address entitled, "What Civilization Owes to the Inventor," was delivered by Donald Carter, patent attorney, before the Chicago Jovian League on November 16. Mr. Carter referred to many of the inventions which we use in our daily life which have become indispensable and have been a measure of our civilization.

The amendment to the constitution of the Jovian League providing for the separation of the offices of secretary and treasurer was passed and G. W. Cummings was elected secretary. G. A. Freeman continues as treasurer.

Importer in the French Antilles Seeks to Establish Relations with American Manufacturers.

Joseph Favre, of Pointe-A-Pitre, Guadeloupe, French Antilles, who is understood to be one of the principal purveyors to electrical plants in the French Antilles and at this time unable to deal with French houses, desires to establish trade relations with American manufacturers. Mr. Favre corresponds in French.

Electrical Engineering Problems.

By R. G. Hudson and W. V. Lyon.

DIRECT CURRENTS.

Problem 11.

Given the following data regarding a separately excited direct-current dynamo: number of poles, six; lines per pole, 2×10^6 lines; number of armature conductors, 500; speed, 1,200 revolutions per minute; size of copper wire on armature, No. 6, B. & S. gauge; length of wire on armature, 1,000 feet.

Find the armature voltage of this machine, (*a*) when the armature is lap-wound, and (*b*) when the armature is wave-wound; find the resistance of the armature between brushes, (*c*) when it is lap-wound, and (*d*) when it is wave-wound; (*e*) for which type of armature winding will the machine deliver the more continuous power?

SOLUTION OF PROBLEM 11.

In Problem 9 it was pointed out that the homopolar dynamo was only suitable for the generation of low emfs. It was shown in Problem 10 that a high emf. may be generated in a "Gramme-ring" armature but that such an armature was difficult to wind, was of high resistance and made necessary a long air-gap. In the drum-wound armature these defects are eliminated, the armature conductors being first wound in forms and then sunk in slots cut in the surface of the armature. These form-wound coils are then connected in series making a closed winding. If overlapping coils are consecutively connected in series the winding is called a lap-winding and if non-overlapping coils are consecutively connected in series, the winding is called a wave-winding. The following properties of these windings should be noted. Lap-winding: number of brushes (*b*) equals number of poles (p) and number of paths (p') in parallel between positive and negative brushes equals number of poles (p). Wave-winding: number of brushes (*b*) equals two or a multiple of two (preferably two), and number of paths between positive and negative brushes equals two.

The emf. generated in a drum-wound armature is given by

[29] $E_a=p\phi Z(r.p.s.)/p'\times10^{-8}$ volts

where (p) equals the number of poles, (ϕ) the total flux per pole, (Z) the total number of conductors connected in series on the armature, (*r.p.s.*) revolutions per second, and (p') the number of parallel paths between brushes.

Answer to Question a.

By [29],

$E_a=6\times2\times10^6\times500\times20/6\times10^8=200$ volts.

Answer to Question b.

By [29],

$E_a=6\times2\times10^6\times500\times20/2\times10^8=600$ volts.

It should be noted that, except in the case of a bipolar dynamo, the emf. generated in a wave-wound armature is always higher than that generated in a lap-wound armature under the same conditions.

Answer to Question c.

Assuming the temperature of the armature to be 77 degrees Fahrenheit, and referring to the wire table (Problem 7) it is found that the resistance of 1,000 feet of No. 6 wire is 0.402 ohm. Since there are six paths on a lap-wound, six-pole armature, the resistance of each path is 0.402/6 or 0.067 ohm. Then the joint resistance of the six parallel paths [9] is 0.067/6 or 0.0112 ohm.

Answer to Question d.

In the wave-wound armature there are two parallel paths and the resistance of each must be 0.402/2 or 0.201 ohm, then the joint resistance of these two parallel paths [9] will be 0.201/2=0.100 ohm. It should be noted that the actual resistance between brush sets will be greater than that given in the above two cases, since no account has been taken of the resistance of the joints and brush contacts.

Answer to Question e.

The continuous power which may be delivered from the armature of a generator depends upon the emf. generated in the armature, the resistance of the armature between brushes, and the current which the armature will carry continuously without overheating. Since each armature under discussion is wound with the same size of wire, each path on either armature will carry the same continuous current (I) without overheating. The maximum continuous current carried in the two cases will then be $6I$ for the lap-wound armature, and $2I$ for the wave-wound armature. The maximum continuous output of the lap-wound armature will then be, by [19] and [20],

$$P=200\times6I-(6I)^2\times0.0112$$
$$=1{,}200I-0.4I^2$$

For the wave-wound armature,

$$P=600\times2I-(2I)^2\times0.100$$
$$=1{,}200I-0.4I^2.$$

It is then evident that the maximum power delivered by either machine is the same and that the wave-wound machine is adapted to high-voltage conditions and the lap-wound to high-current conditions.

ALTERNATING CURRENTS.

Problem 61.

A 1,000-kilovolt-ampere, 60-cycle transformer has a voltage ratio of 66,000 volts to 6,600 volts. The magnetic core has a cross-section of 278 square inches and an average length of 95 inches. The magnetization and core-loss data for the grade of steel of which the core is built up is given in the following table[1]:

Ordinates	Abscissas	
Flux density	Magnetizing field	Core loss at 60 cycles
Kilolines per sq. in.	$H=0.7Nl_\Phi/l$	Watts per cu. in.
40.0	2.0	0.132
53.0	3.0	0.206
61.5	4.0	0.262
67.0	5.0	0.300
73.6	7.0	0.352
80.0	10.0	0.406
86.0	15.0	0.457
89.6	20.0	0.490

(*a*) How many turns should there be in the high and low-tension windings in order that the maximum flux density in the core shall be 72,000 lines per square inch? (*b*) What is the core loss at the rated voltage? (*c*) What is the ratio of the no-load curent to the full-load current? (*d*) What is the power-factor at no-load?

1 This table is taken from "Problems in Alternating-Current Machinery" by Waldo V. Lyon.

SOLUTION OF PROBLEM 61.

Answer to Question a.

The maximum flux density multiplied by the cross-sectional area of the magnetic core gives the total maximum flux.

$$\phi_m = 72{,}000 \times 278$$
$$= 20{,}000{,}000 \text{ flux lines.}$$

By [37a],

$$66{,}000 = 4.44 N 60 \times 20 \times 10^8 \times 10^{-8}$$
$$N = 1{,}240 \text{ turns in the high-tension winding.}$$

By [36a],

$$66{,}000/6{,}600 = 1{,}240/N_2$$
$$N_2 = 124 \text{ turns in the low-tension winding.}$$

Answer to Question b.

Referring to the table, the core loss at 67,000 lines per square inch is 0.300 watt per cubic inch, and at 73,600 lines per square inch is 0.352 watt per cubic inch. The loss at a flux density of 72,000 lines per square inch is found as follows:

$$\text{Loss} = 0.300 + \left\{ \frac{72{,}000 - 67{,}000}{73{,}600 - 67{,}000} \right\} (0.352 - 0.300)$$
$$= 0.339 \text{ watt per cubic inch.}$$

$$\text{Total core loss} = 278 \times 95 \times 0.339$$
$$= 8{,}960 \text{ watts.}$$

Answer to Question c.

The full-load current of a transformer is found by dividing the rated kilovolt-amperes by the rated kilovolts. In this case the full-load current on the high-tension side is

$$I_1 = 1{,}000/66$$
$$= 15.15 \text{ amperes.}$$

On the low-tension side it is

$$I_2 = 1{,}000/6.6$$
$$= 151.5 \text{ amperes.}$$

Referring to the table, the magnetizing force at 67,000 lines per square inch is 5.0 and at 73.6 lines per square inch is 7.0. The magnetizing force at 72,000 lines per square inch is found as follows:

$$H = 5.0 + (72{,}000 - 67{,}000)/(73{,}600 - 67{,}000)(7.0 - 5.0)$$
$$= 6.52$$

In the expression $H = 0.7NI_\phi/l$, (N) is the number of turns in the magnetizing winding, (I) is the ampere value of the magnetizing current and (l) is the length of the magnetic circuit expressed in inches. (H) is the maximum magnetizing force corresponding to the maximum flux density. In the case of direct currents the expression for the magnetizing force would be

$$H = 0.495 N I_\phi / l$$

[0.7 ÷ 0.495 = 1.414 = ratio of maximum value of alternating current to ampere value.]

In this case we have

$$6.52 = 0.7 \times 1{,}240 \times I_\phi / 95$$
$$I_\phi = 0.714 \text{ ampere.}$$

This is the magnetizing current. Besides this magnetizing current there is also a core-loss current (I_c) in the winding at no load.

This latter component is equal to the core loss divided by the applied pressure and is:

$$I_c = 8{,}960/66{,}000$$
$$= 0.136 \text{ ampere.}$$

The no-load or exciting current (I_n) is equal to the square root of the sum of the squares of the magnetizing and the core-loss currents.

$$I_n = \sqrt{I_\phi^2 + I_c^2}$$
$$= \sqrt{0.714^2 + 0.136^2}$$
$$= 0.727 \text{ ampere.}$$

The ratio of the no-load to the full-load current is

$$0.727/15.15 = 4.8 \text{ per cent.}$$

Answer to Question d.

By [2a],

$$PF = 8{,}960/66{,}000 \times 0.727$$
$$= 0.187.$$

Columbus Safety Exposition to Show Electrical Apparatus.

Electrical apparatus will be prominent in the displays which will be shown at the Industrial Safety Exposition to be held at Columbus, O., January 13 to 16, under the auspices of the Ohio Industrial Commission. A representative of the commission was in Cincinnati recently, and was successful in obtaining promises of co-operation from a number of manufacturers in various lines of business, who will show equipment provided with safety devices. The superiority of electrical drive from the safety standpoint, however, will be emphasized by the electrical exhibits, such as direct-connected motors, doing away with belting and other transmission equipment, and manufacturers of motors and other electrical goods anticipate much good from the display.

DIRECT CURRENTS.

Problem 12.

The external characteristic of a 115-volt, 10-kilowatt shunt generator is shown in Fig. 12. The resistance of the shunt field is 40 ohms, and the resistance of the armature is 0.06 ohm.

Find (a) the armature current, field current and line current respectively at full load; (b) same at no load; (c) armature voltage at full load and no load respectively, and (d) explain why the terminal voltage of a shunt generator decreases as the load increases.

This problem illustrates the properties of a shunt generator.

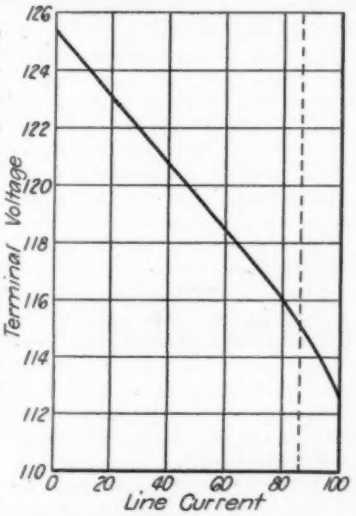


Fig. 12.

ALTERNATING CURRENTS.

Problem 62.

The name plate of a transformer gives the following information: "100 kilovolt-amperes, 13,200, 6,600 :220, 110 volts, 60 cycles." Both the high- and low-tension windings are divided into two equal parts which may be connected in series or in parallel. With both windings connected in series the percentage distribution of the losses at full load is: copper loss, 1.0 per cent; eddy-current loss, 0.24 per cent; hysteresis loss, 0.78 per cent. (a) What different ratios of transformation can be obtained with this transformer? (b) With both high- and low-tension windings in series the transformer receives power from a 6,600-volt, 25-cycle circuit. What is the eddy-current loss? What is the hysteresis loss? On the basis of the same total losses what should be the full-load rating?

This problem illustrates the series and parallel arrangement of transformer windings and the effect that the impressed voltage has on the full-load output.

Solutions of the above problems and two new problems will be printed in the next issue.

CONFERENCE OF AMERICAN MAYORS.

Public Policies of City Officials with Relation to Municipal Utilities Discussed at Philadelphia.

A conference of American mayors was called by the executives of Philadelphia, New York, Chicago, Cleveland and Dayton, at Philadelphia, on November 12, 13 and 14. An opening reception to the visiting mayors and delegates was held at the Bellevue-Stratford Hotel on Thursday evening. Ex-Governor Stuart, of Pennsylvania, made an address of welcome, and was followed by Mayor M. C. Hocken, of Toronto, Canada, who was one of the delegates in attendance. Upon the Reception Committee were, among others, Morris L. Cooke, director of public works of Philadelphia; Thomas E. Mitten, of the Philadelphia Rapid Transit Company; Joseph B. McCall, president of the Philadelphia Electric Company; Samuel Rea, president of the Pennsylvania Railroad; A. Merritt Taylor, director of city transit of Philadelphia.

Delegates to the convention included not only mayors, but other representatives of city governments, members of public service commissions, university professors, a few representatives of utility corporations, and various others interested in the subject of municipal utilities. The mayors of fifty cities were present in person, while many others were represented by other officials. The total registration was about 400.

The first regular session of the conference was held at the Bellevue-Stratford on Friday, and was called to order by Mayor Blankenburg, of Philadelphia, at 10:20 a. m. The first address was made by Delos F. Wilcox, a former public utility commissioner of New York, and was entitled "Fundamental Planks in a Public-Utility Program."

Mr. Wilcox said that the interests of the cities and of the utilities are the same at many points, but there is nevertheless an inexpressible conflict between the two, owing to a conflict of motives, due to profit seeking. There is a great need for clarity of ideas on fundamentals. These fundamentals involve the questions: (1) What shall be the nature of investments in utilities, speculative or not? (2) What shall be the relations of the utility to the city; shall it be a money maker to relieve taxpayers? (3) Should utilities be regarded as permanently private or should ultimate municipal ownership be looked forward to? In his opinion investments in utilities should be non-speculative, and regarded as good security as municipal bonds. Municipalities should not make up past losses during the speculative period, but should guarantee utilities against future losses from investments desired by the city. Utilities should not furnish the opportunity for any man or set of men to get rich. There is no good reason for such opportunities if returns are guaranteed, and it is not necessary for efficiency in management and good service. In valuation cases before commissions we now have the absurd contradiction that a utility claims greater valuation if it has made good profits, and greater valuation if it has had previous losses. Answering the second question, Mr. Wilcox said that utilities should not be regarded as legitimate sources of profit to cities for the purpose of reducing taxes. Rates should be only sufficient to pay the cost of service, unless profits are used for the amortization of the original investment. At present utilities should be self-sustaining, although a time may come when service will be furnished without cost to users. He favored amortization within a generation and the gradual elimination of private capital. This plan would give greater security to the remaining capital and reduce interest rates. Such amortization involves ultimate municipal ownership, which, he believed, both desirable and inevitable. Cities should prepare for it.

A motion was then passed directing a telegram of greetings to be sent to the conference of governors being held at Madison, Wis.

Nathaniel T. Guernsey, general counsel of the American Telephone & Telegraph Company, then made an address on "The Regulation of Municipal Utilities." Mr. Guernsey first defined the term "regulation," which means subjecting utilities to rules, restrictions, and governing principles. He quoted the United States Supreme Court to the effect that the public has no right to interfere in the actual management of private utilities. Regulation removes the necessity or desire for competition. The importance of regulation is shown by the fact that the investment in the United States in local utilities, excluding railroads, etc., is nearly $9,000,000,000. The public wants good service, the widest possible extension of service, and a fair price. Anything less than a fair price is confiscation. Utilities are not finished investments; they must be continually enlarged, and additions require fresh funds, which must be obtained from those seeking investment. They can only be obtained if there is a profit commensurate with the risk involved, as compared with other investments. The second essential, from the utility standpoint, is that freedom in the transaction of business which is necessary to progress and to efficient, economical operation. Millions of dollars are being spent for regulation, and this cost necessarily falls upon the public. To be a benefit, the regulating body must be composed of men of unquestioned integrity and force of character; these men must have not only the capacity, but also the training, necessary to the proper determination of the questions involved; these men must be free from other interests and engagements, which would prevent their giving to the performance of their duties the time necessary for sound results. Regulation should be not local, but state-wide. City officials are the direct representatives of the public, and consequently represent the interests of one side. They cannot be impartial; moreover, they are not usually qualified to cope with the problems which arise, nor are they in a position to give the time and effort necessary. They are seldom in office long enough to acquire the necessary experience. There has been much criticism of the participation of public utilities in municipal politics. They do not belong in politics and are not there of their own volition, but conditions beyond their control have forced them in. Their regulation by city authorities inevitably brings them into intimate relations with every political faction in the community. The argument for local self-government is not a sound one. Public interest does not require local authorities to do things which may be better done by others. State commissions have the advantages of greater permanency and freedom from local influences, yet have not been able to obtain results with which they, themselves, are satisfied. City boards would be subject to all the difficulties of a state commission and to many additional ones. They would necessarily be less efficient. There are some things which cannot be accomplished by regulation. Some people have the idea that the function of a regulating body is to decrease prices. They cannot be indefinitely reduced. Service cannot be had for less than it costs. To attempt to do so is to invite bankruptcy. Insolvent corporations never give good service. If the public wishes good service it must pay for it. Regulation is yet in the development stage. To succeed there must be co-operation of the public and the utilities, with a frank recognition of the principles stated. This should result in good-will, decreased cost, and increased efficiency.

The next address was on Philadelphia's transit problem, by A. Merritt Taylor, director of city transit.

Mr. Taylor explained the necessity for providing better transit facilities in Philadelphia, which the city proposes to do by building high-speed arteries, for which the surface lines would be feeders. Legislation has already provided the city with the financial ability, the legal right, and the executive procedure, to do this. He proposed to co-operate with the ex-

isting railway system. The use of the public credit in financing this system was necessary and desirable, and ultimately the city will own the subway and elevated lines, through payments out of the profits. He said that "Philadelphians stand for a 'square deal' between the city and vested interests. We recognize the vital importance of honestly protecting capital invested in Philadelphia to the extent that it shall produce an attractive return for reasonable service rendered to the public. In the case of our local railway system, a contract was entered into in 1907 between the city and the company. With the terms of this contract in force as a basis it is the policy of the Department of City Transit in establishing the high-speed lines under the terms of the co-operative program, to protect the company to the extent of its annual net earnings gained prior to the opening of the municipally owned lines, regardless of the amount of capital actually invested in the property. We want Philadelphia to stand out as a safe place for the investment of capital for public service. We recognize the great part which the railroads and other public-service corporations can take in the development of this city and its industries, but to so take this part they must have credit upon which to raise large sums of money and they must be assured of an adequate and attractive return thereon and immunity from unwarranted competition or political and public attacks. The capitalists of this country are going to invest their money in communities where capital is justly treated and permitted to earn attractive returns and are not going to invest capital in communities where its security is impaired and its productiveness is unduly curtailed by unreasonable legislation, regulation or competition. I believe that the time is past when corporations, through political, financial or other influence, can retard the development of the resources of our great cities, make unfair bargains for franchises or refuse to co-operate upon just terms in carrying out great municipal developments and undertakings which are dependent upon their co-operation. On the other hand, I believe the time is at hand when cowardly public officials will not be permitted by the thinking public to be led by blackmailers and demagogs into imposing unreasonable and onerous terms and conditions upon corporations and vested interests; they will no longer be able to make political capital by pursuing any such course in an enlightened community. The people of Philadelphia will be fair with corporations and with capital, but they will demand the same fairness from corporations and capital in return."

Street Lighting.

The next address was by Ray Palmer, commissioner of gas and electricity of Chicago, on "Municipal Lighting Rates." Mr. Palmer pointed out the lack of co-operation on the part of municipalities in dealing with their lighting problems. The result is a great discrepancy in the rates paid by different cities. Rates are often high because no thorough investigation has been made of the conditions. The aim should be for economical rates and efficient service, but a low rate is not necessarily economical, as the service may be poor. Cities having similar conditions often have great discrepancies in rates. The rates are sometimes high, on account of a lack of knowledge of those in authority, or to political influence. The wage scale of labor often is a material item in the cost. Politics and the relatively high union scales of wages, are two factors which discourage municipal ownership. Until these two elements are equalized, as between municipal and private operation, municipal ownership will seldom be economical. He then pointed out the factors which enter into the cost of street lighting, their treatment in Chicago, and the considerations that should be taken up in deciding upon a system of street lighting. Local conditions must often determine this. Lighting by gas mantles, gasoline, or tungsten electric lamps has been largely standardized, but this is far from true with electric arc lamps. In determining upon the relative merits of different arc lamps the following factors should be considered: total light flux, distribution of light, constancy of light or flicker, light efficiency, mechanical efficiency, regulation, power-factor, accessibility, design, materials, reliability in service, and electrode consumption. He then compared costs in Philadelphia and in Chicago. He pointed out that Chicago has a comparatively low cost for street lighting, and a cost per mile less than one-third of the value for New York, Philadelphia, or Boston. He described the equipment used in Chicago and analyzed the costs. For arc lamps, the total annual cost is $56.13, of which $24.81 is for fixed charges, and $31.32 for operation. Of the latter $11.44, or a little more than one-third, is paid to the Sanitary District for energy. The remainder is for maintenance and repairs, trimming and patroling. The energy is consequently a small item in the total cost. It is contracted for at $15 per horsepower per year, which is approximately equivalent to 0.5 cent per kilowatt-hour. Wages in Chicago are high. Chicago's investment per arc lamp on the underground distribution system is approximately $500, and for the overhead system $216. In some districts of the city, lighting is by 450-watt flaming arc lamps, supplied by the Commonwealth Edison Company for $75 per year. About 0.6 of the municipal arc lamps are of the 10-ampere flaming arc type. The open arc lamps have been replaced by nitrogen-filled tungsten lamps. He considers the latter preferable to flaming arc lamps, and it is planned to replace 6,188 of the inclosed carbon arc lamps with them during the next two years. The principal saving in operating the nitrogen-filled lamp is in the item of trimming and patroling. He pointed out that Chicago also had a low retail lighting rate, secured by the 1913 contract ordinance, compared to that prevalent in the other large cities in the country. Buffalo, which is supplied by water power, is the only city having a lower average rate. This is partly due to the large and efficient generating units used, and to the excellent load-factor realized by supplying power to the street railway lines. The reason why Chicago has the cheapest electric lighting system, Philadelphia the cheapest gas lighting, and Cleveland the cheapest water, should be known to all, so that similar methods can be utilized in other places. He commended the objects of the proposed Utilities Bureau.

Interlocking Directorates.

The last address of this session was by Louis D. Brandeis, on the subject of "Interlocking Directorates." Mr. Brandeis explained the objections to interlocking directorates, since they tend to obscure facts. A director's interest should not be divided. A user of funds should not be represented by the same man as the banker and the loaner. To get the best results we need different men on different sides of all dealings. "No man can serve two masters." The Clayton Act has provided against this condition, so that the directors of railroads and industrial corporations shall not buy supplies from themselves, etc. The directors of a corporation should be active advisors and critics of the enterprise. One man cannot have a wide knowledge of the facts in many enterprises. The New Haven troubles were due largely to the ignorance of its directors. Even with the best men upon boards of directors, there will be an inevitable influence if too much financial power is centralized. There is a similar objection to the watering of stock, namely, the obscuring of the facts. The objection was not that it permitted profits to be secured, as he agreed with Mr. Guernsey on giving suitable returns to the investor after full consideration of the risk involved in the investments. He considered it for the public interest that both funds and ability in management should be properly recompensed. A knowledge of facts is necessary, however, to do justice, and these facts with regard to the cost of plant and of operation should be comprehensive, accurate, and recent. The proposed Utilities Bureau would help municipalities to reach these facts. Utilities co-operate through such societies as the National Electric Light Association, the American Electric Railway Association, etc., and there should be similar co-operation on the

side of the municipalities through a central bureau of advice and information.

In the open discussion which followed, T. S. Scanlan, one of the city commissioners of Huntington, W. Va., told of the utilities in that city, which has had a remarkable growth. The city has the commission form of government and all dealings with utility corporations are in the hands of one commissioner. He deals directly with the utility companies, and also represents the city before the state commission, if that should be necessary. Dealings with the utility companies have been satisfactory, and the service supplied by them is also satisfactory.

W. J. Stern, mayor of Erie, Pa., raised the point, in connection with the address of Mr. Wilcox, as to utilities bringing in a profit to the city. He did not see why such profit should not be utilized to relieve the tax payer.

Regulation of Utilities.

The afternoon session was presided over by Carter H. Harrison, mayor of Chicago, who delivered an opening address on "How Shall We Control Public Utilities."

Mayor Harrison said that formerly the utilities controlled the cities. While the old methods had been abandoned by utility corporations, they are now using different methods to gain the old ends. Their main aim is profit. He referred to conditions in Chicago and in the Illinois State Legislature in the time of Yerkes, and then discussed local and state regulation, and admitted that the arguments favored the latter until one comes to consider the human equation. Appointments to such a commission are likely to be influenced by political and other considerations. The same objections apply to a commission appointed locally by a mayor, but such an official is more directly answerable to the community interested. He thought state control was better than no control, but preferred local regulation. Better than either is public ownership. The more efficient management under private ownership benefits only the stockholders. Increased responsibility on the citizenship which accompanies public ownership would be advantageous. The first requisite for such a régime is rigid civil service. The pay to employees is usually higher under public than under private ownership. This increases the cost of operation, but is no real objection, as it is desirable for the city to set an example of a higher wage. He advocated non-partisanship and a short ballot in local elections.

An address was then made by Edward W. Bemis, member of the Board of Supervising Engineers, Chicago, on "Some Present-Day Issues in Regulation." Mr. Bemis pointed out that 10 years ago Massachusetts was the only state having a regulating commission for its public utilities. The cities were then waking up to the fact of their own ability to regulate or their proposed powers in this direction under new home-rule charters. The usual method of regulation then was for the city to fix rates; the utility corporation could then either accept these rates or take the case into court and prove that the rates were inadequate. A wave of municipal ownership, led by Tom Johnson, of Cleveland, was started about this time. He referred to a report of the National Civic Federation, which contained the recommendation that the power to institute municipal ownership was better than more direct forms of regulation for cities. Under the leadership of Governor Hughes, New York started state regulation, and many states have followed. This has resulted in a halt to the progress of municipal ownership. He remarked upon the enormous increase in the business of public utilities, which had increased from two to four times in the last 10 years. He commented upon the tendency of state commissions to assume the attitude of courts and decide cases by the evidence submitted, rather than by their own investigation. He considered the position of a city to be preferable before a court than before a state commission. In some states a city cannot appeal to court from the decision of a commission, but a corporation can always do so. Maryland has a special attorney appointed to represent the people in cases coming before the commission. The personnel of the commissions is of great importance. Such men need not only integrity and courage, but ability in this particular field, and the power of analysis. In some states the quality of the commissioner is deteriorating with successive appointments. The method of determining valuations needs close study. The utilities generally are endeavoring to base valuations upon the cost of reproduction, regardless of the original cost or actual investment. The two usually differ by the unearned increments represented by appreciation in value of land, paving not actually laid by the utility, increases in prices for materials and labor, and the expense of building up the business, which has usually been paid out of earnings. He quoted Commissioner Eshleman, of California, to the effect that utility owners attempt to raise their valuations to the utmost to cover watered stock. The New Jersey commission, however, is the only one which has allowed any going value in rate cases, except to make up early deficits. He then referred to the Haverhill gas case in Massachusetts, in which the Massachusetts commission advocated that there should be no return on investments which had been made out of earnings. Before this case was decided in court, the utility owners withdrew it and accepted a rate based upon this proposition. He disapproved of the action of certain state commissions which have been approving stock issues for large amounts without any investigation. Each city now approaches its utility problems as a new proposition, and city attorneys are not usually in office long enough to be familiar with such matters. Syndicates of capital should be met by a syndicate of cities, such as would be brought about by the establishment of the proposed Bureau for Utility Research.

Stiles P. Jones, secretary of the Voters' League, of Minneapolis, made the next address, which was entitled "What Certain Cities Have Accomplished Without State Regulation." He claimed that the greatest success in regulating rates had been secured in cities where there was no state regulation. He considered that state regulation, however good, would postpone municipal ownership, which he regarded as the ultimate goal. As examples of success in controlling rates without the intervention of state commissions, he cited the street railway and gas supply in Minneapolis, the gas supply in Indianapolis, which has the lowest price in the country, the electric rates in Seattle, Winnipeg, Pasadena, and Kansas City, Kans., all of which were due to the competition of municipal plants. In no case have these companies been made bankrupt, but the competition has resulted in prices which represent the lowest in the country. Other cases cited were Duluth, Detroit, Toledo, Cleveland, Columbus, and San Francisco. In closing, he stated that while he did not defend the competitive method, it must be admitted that it has brought results, and he made a distinction between competition from private corporations and from a municipal plant. He thought no state law should interfere with municipal ownership.

The next address was by Charles Day, of the firm of Day and Zimmerman, utility managers of Philadelphia. His subject was "A Constructive Policy for Public-Service Corporations." Mr. Day assumed government regulation at the outset, and considered the principles involved in a constructive policy which he illustrated by means of an electric plant. He referred to the principles of Taylor as applied in scientific management, and went into some detail in showing how these could be applied to a particular case. The utilization of scientific principles and their application to engineering has brought about the use of the most modern machinery, and many points in engineering which were formerly settled upon an empirical basis were now dependent upon scientific principles. The engineer has supplied the best possible facilities and the manager must utilize these facilities in securing the most efficient management. Contrasting present conditions with the past, he pointed out that operating costs of generation had been brought to five mills per kilowatt-hour by many concerns; that

continuity of service, such as was previously undreamt of, is now secured; and that power generation and distribution are no longer dependent upon matters of opinion. He pointed out that the same principle could be applied to construction, stock keeping, cost keeping, accounting, etc. He then explained the elements entering into the cost of electric service, and pointed out that a straight kilowatt-hour rate cannot be just. The advantages of a proper system of rates were explained. A constructive policy should include publicity of records, a full knowledge of the facts in connection with the results of operation, the participation by the corporation in the benefits of economy and efficiency, and the handling of the utility's activities on the basis of (*a*) the records of the business; (*b*) the scientific training of employees; (*c*) the scientific analysis of data; and (*d*) putting the burden of management on the managers. As yet these principles have been but little applied, and the new condition cannot be reached in a day, nor by the simple issuance of orders. Where applied, the new philosophy of management has given remarkable results, and the same can be expected in the public service.

John M. Eshleman, president of the Railroad Commission of California, then spoke on "What Regulation Must Accomplish if It is to be Permanent." Mr. Eshleman said that utilities are natural monopolies, and competition cannot give the best results, although it has sometimes given better results than monopoly. It is usually better than monopoly without regulation. The best regulation results in the utility giving the best service at the lowest cost that it can afford to give. He opposed the attitude of some state commissions in announcing a policy of monopoly for established utilities, as the latter then do no more than they are required to. The public does not see that such conditions are any better than competition. The California Commission has adopted a somewhat different policy, since it judges of the performance of an existing utility at the time when the competitor applies for a certificate of convenience and necessity. In one case the California Commission permitted competition, which may be regarded as an economic sin, but which resulted in rates elsewhere in non-competitive territory being reduced 30 per cent. To get the best from existing utilities the latter must know that competition will be permitted if they do not give it. He pointed out the mistake in policy of private utility owners who contend for all of their legal rights, when these are not really equitable. It sometimes results in duplication of plant by the municipality, and the final necessity of scrapping the private plant. After a privately owned plant does its best, the question arises: "Is this best as good as can be done by a publicly owned enterprise?" One point where it cannot be as desirable is in connection with the rate of interest which it may pay for capital.

A motion was then passed for the appointment by the chairman, of a Committee on Recommendations, and the appointments to this committee were announced at a later session as follows: Newton D. Baker, mayor of Cleveland, O.; Edward D. O'Brien, director of utilities, Seattle, Wash.; Theodore Theime, Citizens' League of Indiana, Fort Wayne, Ind.; Frederick W. Donnelly, mayor of Trenton, N. J.; John P. Mitchell, mayor of New York; Charles E. Merriam, alderman, Chicago; Milo R. Maltbie, public service commissioner, New York; John M. Eshleman, commissioner, San Francisco, Cal.; H. C. Hocken, mayor of Toronto, Can.; F. C. Thompson, mayor of Chattanooga, Tenn.

The meeting was then thrown open to general discussion. Andrew J. Gallagher, of San Francisco, expressed his disgust with efforts to regulate utility corporations, and expressed himself in favor of municipal ownership.

Percival R. Moses stated that under regulation rates of from 1 to 15 cents per kilowatt-hour for electric energy should not be permitted in the same community. He criticized the New York Commission for not having met this issue, and claimed that rates such as referred to were not based on cost, but upon competition of isolated plants.

H. C. Hocken, mayor of Toronto, Canada, mentioned the rates of the municipal hydroelectric commission in that city, which buys electric power generated at Niagara Falls in bulk, at a cost of $15 per horsepower-year.

John Wessel, Jr., of Fort Wayne, Ind., referred to the municipal electric light plant in that city. H. W. Ashley, of Toledo, O., and D. W. Wilbur, of Poughkeepsie, N. Y., inquired for an explanation of the differences in the kilowatt-hour rates to different classes of customers. This point was explained by Charles Day.

Mr. Williams, of Baltimore, Md., presented the greetings of Mayor Preston, who was unable to be present, and called attention to the arrangements being made by the Fidelity Company of that city to charter an ocean steamer which would carry a party of business men to the various ports of South America, circling around that continent, and returning through the Panama Canal. The object is to stimulate closer trade relations.

Local and State Regulation.

The third session of the conference was held under the auspices of the American Academy of Political and Social Science in the auditorium of the Central High School. John Purroy Mitchel, mayor of New York, acted as presiding officer.

The subject under discussion for the evening was "Local and State Regulation of Municipal Utilities." In his introductory remarks, Mr. Mitchel stated that he was very glad to have joined in the call for this conference, which he considered would become a form of clearing house for the various cities of the country. He called attention to the necessity for a bureau of information which would be at the call of any municipal officials who might need aid in the solution of problems which would come before them. He stated that at the present time the Commissioner of Water in his city was considering a revision of rates for the Borough of Queens, and though lacking data on the subject, there was no available source of information. He said that the thought of a public service company unregulated is foreign to present-day ideas. Public opinion is a reserve power to accomplish results if public-service companies do not heed the trend of the times. Utility corporations deserve their fair share of profits. In speaking of municipal utilities, he believes that profits for the city treasury should come after other considerations of service, wages, low rates, etc. In New York there are at present two commissions, one having jurisdiction over New York City, the other supervising the balance of the state. Their members are appointed by the governor for a term of years, and they are not responsible to city officials, but they can levy on the city for any funds they consider necessary to carry on their work. Mr. Mitchel does not feel that the commissioners are near enough to the public; in fact, do not represent it. He has therefore secured a public prosecutor to take the public's side before the commission.

Mayor Blankenburg of Philadelphia was then called on for a few remarks, in which he emphasized the importance of the present convention and of the results which are expected to issue therefrom.

The next speaker was Halford Erickson, of the Railroad Commission of Wisconsin. He stated that the function of a public service commission is to see that the public has good service and equitable rates without discrimination. Wisconsin has gone one step further than most states, giving local bodies power to regulate, subject only to supervision by the state commission. Experience shows, however, that this method is beset with many problems which are solved with difficulty. 94 per cent of the telephone companies and 40 per cent of other utility companies in Wisconsin serve more than one community, and this fact makes local jurisdiction inadvisable, especially so with respect to the physical portion

of the property. Mr. Erickson has not found it to be a fact, as is often stated, that state commissions are more liberal than local commissions in valuation allowances for plant and property. He further pointed out that too onerous regulation results either in poor service or high rates. In either case the public will suffer.

While state regulation of public utilities appears to be reasonably successful, it is objected to by those who do not believe in any regulation at all as well as by many who prefer local regulation. The latter usually claim that local regulation is the only form of regulation that is beneficial to the public. While these claims are hardly sustained the subject is one that readily lends itself to political exploitation especially today when many cities are beginning to find themselves and when there is now and then a notable awakening of the civic consciousness.

Much has been done to determine what the terms "adequate" and "reasonable" signify in actual application to such conditions as those under which utilities are operating. Regulation has in fact resulted in an inexpensive, fair and effective way of settlement of all sorts of disputes and misunderstandings between the utilities and their customers, as well as direct assistance to both sides and especially to municipally owned plants in operating, and in managerial matters.

The regulation of the necessary service furnished by capital privately owned is a delicate matter that should be exercised only in the light of existing conditions. No steps should be taken in this work the justice of which has not been clearly established. Everything should be done to prevent errors and mistakes therein, whether of judgment or otherwise, because the consequences of such errors are costly and in the end have to be borne by the public. When the service is inadequate and the rates are too high, the public has to bear the inconvenience and to foot the bill. Standards of service that are too high and rates for the same that are unreasonably low, are certain to keep capital and business ability away from the public utility field, and the public will then have to suffer from a lack of service or necessary extension thereto. Those who have had actual experience in all phases of this work know only too well that it is as easy to go too far in one of these directions as the other, and that excess in either case is contrary to public policy. In addition to this, the work involved in regulation is complicated and unless carried on on a large scale, is relatively very costly. It is for reasons of this kind that it appears to many that proper regulation is as yet out of reach to all but the largest cities unless it is performed by the state or on some other co-operative basis.

In discussing this paper Chairman Mitchel said that if the principles promulgated by this speaker were applied in New York, it would mean local commissions and home rule for New York City. He very much favors such and thinks New Yorkers can govern themselves much better than outsiders.

The next speaker of the evening was Milo R. Maltbie, member of Public Service Commission for the First District, New York, who said that local or state regulation is a large subject, but so long as we have private companies selling public utilities, we must have some kind of regulation. The state and the municipalities have police powers which cannot properly be taken from them. Every age has its own ideas as to what conditions are proper for it. Expansion of present-day utility companies makes local regulation difficult. Also the small municipalities cannot afford to have paid commissions of the proper caliber.

An exact delimitation of the precise functions which should be exercised by private corporations, by local authorities and by the state is not easily stated. There are those who urge that all control over public service corporations be transferred from local authorities to a state board. Between this extreme and complete local regulation, there is a middle ground, for certain functions can more effectively be exercised by a state board and others more wisely administered by local authorities. The formation of the corporation itself is properly a state function. It is suggested in certain quarters that this franchise should be granted by a state board which should determine not only whether a franchise should be granted but also the terms and conditions of such franchise. This policy is entirely wrong. The whole idea smacks of bureaucratic centralization, of foreign political theories and of the destruction of home rule. Every community should have the right to say what local franchise should be granted.

Control over the issuance of securities by public-service corporations should be lodged in a state authority. Supervision of accounts and the filing of reports are also matters which should be under state supervision, and the forms prescribed should be followed by all even though the utility be operated by a municipality.

The power to review utility rates and to determine what charges shall be made is the function which has attracted most attention. While it is not impossible for municipalities to regulate rates, and while there have been many instances where this power has been wisely and efficiently exercised by municipalities, it will be found increasingly difficult, and if it is not now it soon will be necessary in most instances for the state authority to control rate regulation. The most practical plan is for local authorities to continue to exercise the control now vested in them by statutes and city charters, but to provide that in case of conflict between different local regulations or between local and state regulations, the action of the state regulatory body should be controlling.

The next speaker was Charles E. Merriam, professor of political science, University of Chicago. He stated that the city of Chicago was the victim in 1913 of as daring a raid as a pirate crew ever made upon a rich and defenseless city. A bill was pending in the legislature which created a public utility commission. In article six it conferred on cities the option of exercising identical powers if they chose to undertake the task of regulation. This home-rule article was suddenly stricken out by the House. Upon public protest it was restored by the Senate. On the last day of the session the House refused to concur in the Senate amendment, and to the consternation of Chicago, the act became a law. It swept away most of the powers Chicago had already wrung from the state legislature through a long series of efforts, and snatched away the hope of adding others. If adequate power were conferred upon the city by the legislature, it would be possible to have in Chicago a well equipped staff of experts, supervising service and rates, but responsible to the community which these companies serve, and not to a large and composite state population, most of whom they do not serve. The capitalization of the public utilities of Chicago, excluding railroads, is in round numbers $325,000,000. The capitalization of down-state utilities, excluding railroads, is approximately $300,000,000.

Chicago has now organized a public service department for the supervision of service and the regulation of rates of public utility companies. This department consists of five bureaus: Transportation, Gas, Telephone, Electric Light and Power Engineering.

Its functions are limited to the general supervision of public utility service, and the enforcement of certain provisions in contract ordinances, notably those contained in telephone and electric lighting franchises.

Of the companies operating in Chicago, the Peoples Gas Light and Coke Company and the Elevated Railroads are owned by the Commonwealth Edison Company. Interlocking directorates among the other corporations, as

shown by recent reports, of the Public Service department, are so close as to keep the ownership of this investment in a very few hands. The process of concentration is proceeding very rapidly and it is only a matter of a short time until a single company will control all the public utilities of the city.

The real danger is not that of confiscatory rates or arbitrary service order, against which the corporations are well protected, but that the public will suffer from high prices extracted for inferior service. The real and present menace is the payment of dividends on watered stock, etc. To compel consumers to deal with this huge combination through the devious and indirect agencies of state government will tend to obstruct that vigorous regulation which the public interest requires, and which it should be the object of sound legislation to secure.

The real reason why many corporations prefer state to local control is not that one is more "political" than the other, but that the indirect pressure of the state electorate is preferred to the direct pressure of the local electorate. The public service corporations of Chicago will never be as effectively regulated in the public interest by the state, as they will be by the city of Chicago, and the same situation is found in many other large cities. The cry that "politics" will interfere with adequate municipal regulation is itself one of the cleverest pieces of "politics" in the long history of clever utility corporation tactics.

There are those who look with smug satisfaction at the raids upon the economy of our cities, but they will do well to remember that cities deprived of the power to regulate their local utilities may be forced to ownership and operation of them in order to secure the service desired, and denied. In the long run, a generous option to the city of ownership, or regulation, will give the wisest policy and will result in greater gain of both city and corporation.

Ira W. Stratton, mayor of Reading, Pa., and president of the League of Third Class Cities of Pennsylvania, was the next speaker. He believes that we are now passing through an age of social revolution, the object of which is the securing of better service, better government and greater security in the enjoyment of the products of present-day civilization. He called particular attention to the law creating the present Public Service Commission of Pennsylvania. Its powers are broad and autocratic—too much so for any sovereign body. Some of the powers conflict with inherent rights of cities. The decision of the commissioners is final except for appeal to the courts, which latter, however, can only approve or return to the commission for reconsideration. This process consumes much time and prevents the rapid securing of decisions. He thinks the act confers entirely too great powers on a few men who are appointed by the governor and responsible to no body of people. On account of the numerous powers conferred and the large amount of detail work necessarily thereby imposed on the commission, delay is unavoidable, and red tape the order of the day.

Several examples were given citing the expense and hardships imposed by the delay in getting certificates of public convenience made necessary by the terms of the law. In one instance delay caused the abandonment of a new railway projected for a district not yet served. Regulation of this kind does not regulate, it frustrates. He thinks the law should be altered, and it is the intention of the league of which he is president, to make every effort toward such action. Mr. Stratton believes that regulation by public commissions should be that of the issuance of securities and rates for service. Watered stock and high rates should be prevented.

In reviewing the papers of the evening, Mayor Mitchel said that the consensus of opinion seemed to be in favor of a large measure of home rule for local communities.

Municipal Ownership.

At the session on Saturday morning, Newton D. Baker, mayor of Cleveland, presided. In his introductory address, Mr. Baker stated that municipal ownership in this country is largely the outgrowth of the misconduct of the utility corporations, whereas in Europe it has arisen for a different reason. It was inaugurated with the nationalization of the Prussian railways, which was proposed as a military necessity, but was afterwards admitted by Bismarck to have been due to economic and social reasons, one being to relieve a portion of the taxes. He then referred to the manner in which this country, through its worship of the golden calf, has developed exploiters at the same time that it has been developing the resources of the country. There was an awakening, however, about a dozen years ago, when it became generally recognized that the government of the American city represented the great American failure. He referred to the service of Lincoln Steffens in bringing the corruption of American cities to more general public attention. The greatest source of this corruption is generally recognized to be the utility corporation. This corruption has been general among both city councils and state legislatures. It has now largely disappeared, its recurrences being sporadic and no longer open and shameless. The above conditions largely led to the existing movement for municipal ownership, and in some cases to its premature adoption, since public opinion, though aroused, has not been ready for the patient work of carrying it through. This has led to some failures. He regarded municipal ownership as a question of economic policy, not to be adopted universally, but only where it is expedient. He claimed that there was a campaign to strangle public opinion on this question, many of the magazines being controlled through interlocking directorates, and buying the services of talented writers, such as Elbert Hubbard, and John Kendrick Bangs, for their purpose. He scored the latter particularly for his misrepresentation of conditions in Cleveland. To the claim that municipal utilities should not be in politics, he replied that he had always found them in politics, even when privately owned.

Frederick C. Howe, commissioner of immigration, New York City, then spoke on "Municipal Ownership—the Testimony of Foreign Experience." He stated that the Germans considered it bad business to give away the profitable utilities and keep those which are a financial burden to the city. The criterion for public ownership should be whether the maximum service will be obtained in public or private hands. Municipal ownership is the general policy in England; to a somewhat less extent in Germany and Switzerland, and still less in other European countries. Prominent reasons for municipal ownership in those countries are that the earnings relieve taxation, reduction of rates, etc. He then took up in some detail the various municipally owned utilities in Great Britain, paying especial attention to the street railways in Glasgow, and to the gas and electric plants in other British cities. A prominent reason for municipal ownership in Germany, especially as to street railways, was to co-ordinate town planning.

He concluded that European experience showed municipal ownership generally desirable.

H. C. Hocken, mayor of Toronto, Canada, then described the hydroelectric supply to that city, which is municipally operated. Energy is purchased from the Hydro-Electric Commission of Ontario in bulk, and distributed throughout the city. He recited the history of this movement, and the lowering of rates which had resulted. The city offered to purchase the previous private plant at a premium of 25 per cent on the face value of the outstanding stock, but a higher price was se-

cured from another corporation, with the result that there is now competition between the municipal and private systems. This competition has not destroyed either plant, and the total load has grown from 42,500 kilowatts in 1910, to 127,000 kilowatts in 1914. The average rate in Toronto is less than in Chicago, or any other city in the United States. There is a very large number of small customers, the average monthly bill being $1.20. When the employees appealed for an increase in wages, the matter was taken before the federal Conciliation Board to decide, and this resulted in an increase to the employees of both the municipal and the private plants.

R. P. Newman, one of the commissioners of the District of Columbia, stated that all of the district commissioners were in favor of municipal ownership for the national capital. A bill has been favorably reported in Congress looking to this end. Until municipal ownership is achieved, regulation is favored.

A. E. Winchester, one of the commissioners of South Norwalk, Conn., and superintendent of its electric light plant, then described the movement which had resulted in a municipal plant in that city. This town voted for a municipal plant in 1892, and was a leader in municipal ownership in New England. The town now has a plant valued at $200,000, which has been entirely paid for out of profits, and no money has ever been taken from taxes for its support. Its success has been due to freedom from political interest.

C. W. Koiner, superintendent of the municipal plant at Pasadena, Cal., described the conditions leading to the adoption of municipal ownership in that city in 1906. The private company was unwilling to sell its plant to the city at that time. It has since continually cut rates under those offered by the city, until the state commission required it to either stop the price cutting or make the same rate in the other territory which it supplied. The saving to the public in rates has been sufficient to pay the entire cost of the municipal plant.

Clarke M. Rosecrantz, general counsel of the Milwaukee Electric Railway & Light Company, then made an address in behalf of utility corporations. He regarded comparisons with the European utilities as unfair and unreliable, and demanded comparisons with municipal operation in this country. He favored the establishment of the proposed Utilities Bureau, and thought it would be a great advantage if it would result in an examination of private and public plants upon the same basis. The claims made for municipal ownership are frequently based on comparisons which ignore items that should properly be charged to the municipal plants, and which are made up indirectly out of taxes. Where this is done, it should be known. He cast discredit upon the articles of Lincoln Steffens, owing to the superficial manner in which he knew the article regarding Wisconsin politics to have been prepared, and to the misstatements which appeared in it. He claimed that the accounts of municipal plants were never properly kept, and where state commissions have endeavored to get information about these plants they have found it very hard to do so. In substantiation of this claim, he quoted the report of the Wisconsin Railroad Commission to the governor of that state. Answering the claims made for European street railways, he claimed that there was no overcrowding in the street cars in foreign cities because they do not permit the people to get on the cars that are already filled. American people, however, would not accept such methods. The great congestion in American cities is due largely to the enormous office buildings which are found here, and our systems of transportation are almost always inadequate for existing needs before they are completed. He asked that municipal operation be judged by the things the municipalities have already done. For an idea as to their management, he referred to the reports of the New York Bureau of Efficiency, of the Cleveland Chamber of Commerce, and of the Chicago Bureau of Public Efficiency, regarding purchases for the city. In Pittsburgh a bond issue had been made to provide current supplies, which illustrated that the finances of cities are watered just like the stock of corporations. The municipal ferries in New York City are operated at a loss every year. In Europe the successful men of the community are called upon to serve on municipal boards. In America such men dare not serve, because they would be accused of private interests. He quoted a report on street railway operation in Glasgow, by Labor Leader Mahan, which was very unfavorable, and put the matter in an entirely different light from that represented by Mr. Howe. Although fares are low, there are no transfers, and two or three fares are sometimes necessary to reach a desired destination. The service does not compare with that in the United States. Pay to employees is never more than 50 per cent of the average in the United States, and the trackage is usually small, which permits a better financial statement. The function of the government is to regulate, and not to serve, and it should not undertake any business which can be run under private management.

Afternoon Session.

A luncheon was tendered those attending the conference by the business men of Philadelphia in the French Banquet Hall of the John Wanamaker store. Following the luncheon, there was an executive session followed by a general discussion. Mayor Blankenburg introduced C. A. Prouty, formerly Interstate Commerce Commissioner, as presiding officer.

C. O. Baker, editor of *Engineering News,* read a paper on "The Municipal Ownership of Waterworks." He said that in 1900 more than half of the cities of the country had municipal plants, and of the cities exceeding 10,000 in population, three-quarters had municipal plants, including the ten largest cities in the country. However, good service under private ownership has become more possible each year, on account of fairer franchises and state regulation. The speaker favored state control for both private and municipal plants, especially with respect to the purity of supply. Such state control was inaugurated in many cases before the advent of regulating commissions for other purposes through the state boards of health. He thought there should also be control over the method of raising funds.

The next address was by Robert Crosser, United States Congressman from Ohio. Mr. Crosser said he believed in municipal ownership, because public utilities are natural monopolies, and it is not right to permit private parties to control a public service. It is only human for them to do so to their own advantage and profit. While they admit that they should be regulated, it is turning out that they do their utmost to avoid any regulation which reduces profits. This is well exemplified in the Spokane railroad rate case, which has been pending for years in the courts. He considered public ownership the best solution of the problem, and thought this policy should be carried to all utilities which require the use of public property and which are natural monopolies.

A telegram of greeting from Oakland, Cal., was then read. It contained an invitation to meet in that city in 1915.

Felix Frankfurter, a member of the Board of Trustees of the proposed Utilities Bureau, then spoke. He said that the vital factor in utility matters was that with private ownership there is not an identity of interest between the utility and the public. He favored the Utilities Bureau in order to have a better balance of the conflicting interests and a concentration of ability and intelligence on the side of the cities to balance that on the side of the utilities.

Recommendations.

The report of the Committee on Recommendations was then made by Mayor Baker, of Cleveland, chairman of the Committee. He stated that the report was intended to represent the consensus of opinion without going into questions which were in controversy. The recommendations which were adopted by the conference were as follows:

(1) That no general conclusion be formulated upon the abstract question of municipal ownership, but rather we express our judgment to be that municipalties should be given in all instances the requisite power to municipalize public utilities, the expediency of its exercise being at any time and place and with regard to any particular utility a matter for local determination.

(2) That we make no general determination as between state board and local or home-rule regulation of public service corporations. That we do, however, declare that the franchise-making power should in all cases be local; that municipally owned utilities should be subject to local control only; that in large cities local regulation is plainly to be preferred, and that in all cases, the principles of home rule should be preserved by at least leaving it to the people of a city of whatever size to determine whether they desire to act for themselves or to call in a state board, if one exists, either to regulate or to aid the local authorities in regulating privately owned local utilities.

(3) That we indorse the idea of the establishment of the utilities bureau, as a nation-wide intercity agency for bringing the combined ability and experience of all our cities to the service of each city which may face a public-utility problem. Through it we meet the combination of private interests with a combination of public interests, and to the specialized and expert ability which the private interests thus mass in defense of one another we oppose the skill, experience and resources of the united cities of the country.

We recommend that the trustees of the bureau proceed to its further organization, outlining a plan by which its support may be assured, and its services made available. In this connection, we suggest, for the consideration of the trustees, that an office be provided, records kept, experts be employed and that cities which can legally do so contribute on some equitable basis to the expense of the bureau in excess of its earnings when in the service of cities actually using its facilities in the solution of particular problems.

Brief addresses were then made by T. S. Scanlon, city commissioner of Huntington, W. Va.; F. C. Henderschott, manager of the Bureau of Education, New York Edison Company; George N. Seger, mayor of Passaic, N. J.; and D. W. Nevin, mayor of Easton, Pa.

Mr. Henderschott protested that the sentiment expressed in the conference had not been fair to the honest directors of corporations. He pointed out that there was little possibility of better service from government employees than was given by the employees of utility corporations. Evidence of this is seen in the report of the Postmaster-General of the United States. He thought the new state commissions should be given time to work out their problems, and formulate their policies, before they were subjected to much criticism. No one knows better than the utility corporations that they can be compelled to give good service, and that their securities, rates, and everything else can be controlled by the utility commissions. He had lived in a town where the people were very glad to discard municipal ownership. The conference had not represented a fair spirit toward many investors in corporations who are entirely honest and ready to co-operate to get the best results.

Mr. Seger gave the experience of his city with the Board of Public Utility Commissioners of New Jersey. Passaic had succeeded in getting its rate for gas reduced, but most cities go before state commissions without proper preparation.

Mr. Nevin pointed out that it was the utility corporations that had largely made the cities what they are today, and that their present development would not be possible without these utility corporations. He had himself been engaged in utility operation and had never found that there was any complaint when honest men were put at the head of private companies.

A report on the Saturday evening session, which was held under the auspices of the American Academy of Political and Social Science, will be given in the next issue. It was devoted to the subject of "Holding Companies and the Public Welfare," and addresses were made by Francis T. Homer, New York City; Charles F. Matthewson, New York City; and James P. Goodrich, Indianapolis.

Council of Illuminating Engineering Society.

At a meeting of the Council of the Illuminating Engineering Society held on November 12, in New York, N. Y., the Committee on Lighting Legislation presented an interesting report on the laws of several states pertaining to lighting. The committee has had collated the laws relating to lighting now on the statute books of the states of New York, Pennsylvania, and Connecticut. The references to lighting are with few exceptions very general in character. In many cases the regulations relating to lighting are included in sections covering other topics, such as ventilation, etc. The committee now has in hand the preparation of a digest of these transcripts. It has been decided not to proceed at this time with the plan to collate the lighting laws of other states, with the exception of the compilation for Illinois, which is now under way. The committee also considered the general orders of the Industrial Commission of Wisconsin, which form the basis of the industrial lighting regulations of that state. These general orders are subject to modification from time to time at the option of the Commission. The feasibility of formulating a model lighting law for adoption by various states was considered and for various reasons this proposal was thought impracticable at the present time. However, as a step toward meeting the situation, it was decided to formulate a "Lighting Code" on school lighting and another on factory lighting.

A Committee on Popular Lectures was appointed with C. E. Clewell as chairman. For more than a year this committee and a number of subcommittees have been gathering information and data which are being put in the form of six popular lectures on lighting. One lecture will deal with the general principles of illumination; the other five will be devoted to the subject of residence, office, industrial, store and school lighting, respectively.

The following among additional committee appointments were confirmed: Joint Committee of the Illuminating Engineering Society and the American Ophthalmological Society on the Illumination of Test Types; P. W. Cobb, chairman; School Lighting Committee, M. Luckiesh, chairman; Committee on Education, F. K. Richtmyer, chairman; Section Development Committee, C. A. Littlefield, chairman; Committee on Progress, F. E. Cady, chairman; Executive Committee, A. S. McAllister, chairman.

The following representatives of the Society to the United States National Committee of the International Commission on Illumination were confirmed: Louis Bell, Preston S. Millar and J. R. Cravath. Clayton H. Sharp was appointed a representative of the Society to the Standards Committee of the American Institute of Electrical Engineers. S. G. Hibben was appointed a director to fill the unexpired term of F. A. Vaughn, who resigned on account of his election to the vice-presidency. Alten S. Miller was appointed a director to succeed V. R. Lansingh, resigned.

During the past year the Committee on Education has undertaken to ascertain the status of illuminating engineering in schools and colleges throughout the country, and to foster the establishment of such courses as will lead to the degree of Illuminating Engineer.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

Monthly Meeting in New York City.

The 301st meeting of the American Institute of Electrical Engineers was held in the Engineering Societies' Building, New York City, on the evening of November 13, with President P. M. Lincoln in the chair.

The first paper presented was by E. C. Woodruff on "Graphic Method for Speed - Time and Distance - Time Curves."

Graphic Method for Speed-Time and Distance-Time Curves.

The paper presents a very simple method for obtaining speed-time and distance-time curves, which avoids the usual step-by-step process with its tedious calculations. The method consists of plotting certain so-called "service characteristics" upon the diagram of motor characteristics with the speed-current and traction-current curves. The time and distance increments corresponding to assumed speed increments are found by simple divider operations.

The discussion was opened by Selby Haar, who considered the method open to the objections of most graphical methods, that they cannot be relied upon for sufficient accuracy in obtaining guarantees to be used in contracts.

C. O. Mailloux disagreed with this view, since a scale can be used which will give sufficient accuracy. He reviewed his own early work on the subject, which arose through tests on the Manhattan Elevated Railway with Mr. Dodd in 1898. Many different methods had been worked out, but the most satisfactory plan was to use the instrument known as the integraph to draw the curve determined by the area under the original curve. He explained his method in detail and exhibited blue prints illustrating it. The method of the author is ingenious but not new, and he does not consider it a time saver in actual practice.

Mr. Mailloux also presented a discussion by N. W. Akimoff entitled "Starting Curve or Archoid." Under this name the writer proposed a curve the object of which is to embrace in one equation the peculiarities of starting any device, whether a motor, locomotive, engine, etc. The proposed equation was for a speed time curve and was exponential in form. Its application to particular cases was discussed. Its use obviates graphical methods after the constants of the equation are once determined from the curve first plotted.

F. Castiglioni explained a method used by him in problems similar to those of the author, which method involved the same features. This method had been known for years in Europe.

N. W. Storer spoke favorably of the methods presented by Mr. Mailloux and by Mr. Castiglioni. He also read a communication by F. E. Wynne. Mr. Wynne stated that the author's method was a slight modification of one given by Dawson. Graphical methods may be useful when many curves are to be drawn, but not for a single case. For students, a step-by-step method is preferable.

Edward E. Kimball exhibited lantern slides of characteristic curves of motors. He considered the graphical method preferable to an analytic method.

Professor Woodruff then closed the discussion. A paper by Stanley P. Farwell entitled "The Corona Produced by Continuous Potentials" was then, in the absence of the author, abstracted by F. W. Peek, Jr.

The Corona Produced by Continuous Potentials.

This paper deals with an experimental investigation of the corona around small wires as produced by continuous potentials up to 15,000 volts. The continuous potentials were obtained from a series of 500-volt generators. The wire-and-coaxial-cylinder method was employed for a number of experiments. Critical voltages and characteristic potential-difference and current curves were obtained for different-sized wires. The effect of lowering the pressure in the cylinder upon appearance of corona, critical voltage and current, was studied. It was found that the appearance of the corona depended upon the polarity of the wire; positive polarity gave continuous glow, while discontinuous beaded appearance characterized the negative corona, the number of beads being a function of the pressure and the potential difference for a given size of wire. A short arc in series affected the nature of the discharge by superimposing a high-frequency current upon the direct current. Characteristic curves were taken to show the effect of varying pressure, moisture and temperature. For small wires the current was much higher when the wire was negative, but this was not true for the larger wires. Current increases as pressure decreases, as moisture decreases and as temperature increases. The critical voltage is higher for wet air with small wires. An increase of pressure inside the closed cylinder was produced by the application of a potential difference greater than the critical value; this increase is due to ionization. Corona in the case of parallel wires was studied by taking characteristic curves and exploring the field. Field exploration showed anode fall of potential greater than cathode. Corona was accompanied by mechanical effects on wires; deflection on both wires and circular vibration of positive wire.

This paper was discussed by L. W. Chubb, A. E. Kennelly, P. M. Lincoln, Max von Recklinghausen, L. T. Robinson, Selby Haar and F. W. Peek, Jr.

Dr. von Recklinghausen referred to the similarity of the beaded appearance of the corona to a phenomenon which he had observed in the mercury-vapor arc. Little pink beads appear upon the surface of the positive electrode and dance around in varying numbers, disappearing and reappearing. He pointed out that corona loss with direct current is much less than with alternating current, and would not limit the voltage of transmission in that case, as it is said to do with alternating current.

Mr. Peek pointed out that it is the maximum voltage of an alternating wave that determines the corona, and that consequently a higher effective voltage could be used without corona with direct current than with alternating current. He referred to the condition in cables, where the loss caused heating of the insulation, and as the cable gets hotter there is a cumulative effect. With air insulation operation can be carried up to the critical voltage, and there is no loss until breakdown occurs. He pointed out that stroboscopic apparatus permitted the study of positive and negative corona separately on alternating-current lines, and the same effects had been noted as obtained with continuous potentials with the positive and negative electrodes. The effect of a rotating wire obtained by the author had also been observed with alternating current. With regard to the effect of frequency, he stated that the loss with alternating current is proportional to the frequency at ordinary working frequency, but a more accurate formula shows that the loss does not approach zero as the frequency approaches zero. He distinguished between high-frequency corona, low-frequency corona, direct-current corona, and the corona of transients or single impulse. Since energy is involved, it takes time to start the corona. Consequently a higher voltage may be sustained for a short time without breakdown than would be required for continuous corona. Measurements made with transient waves showed that the starting voltage of corona is double the usual value when the time of application is only 0.000002 second.

After adjournment, a smoker was held in the Institute rooms.

Electric Furnace Plant Moves to Keokuk.

The plant of the Johnson Electric Smelting Corporation, Hartford, Conn., is being moved to Keokuk, Iowa, where a works with a capacity of 10 tons of ore per day will be erected and operated by energy obtained from the Mississippi River Power Company. The company uses the electro-thermic process of smelting zinc-bearing lead and copper ores invented by Woolsey McA. Johnson.

Distribution System of a Large Central Station.

At the regular meeting of the Pittsburgh Section of the American Institute of Electrical Engineers, held at Pittsburgh, Pa., on November 10, E. C. Stone presented an illustrated talk on "The Distribution System of a Large Central Station." The system of the Duquesne Light Company—the subject of the paper—serves over 40,000 customers located in an area of 260 square miles. The generating capacity is 92,000 kilowatts and there are 185 miles of high-tension transmission, of which 60 miles are underground. Sixty-two substations are located at points suitable for the distribution of the load. Power is generated at 11,000 volts, three-phase, 60 cycles and delivered directly to the transmission system at 11,000 volts. It is stepped down at the substations for local distribution at 2,300 volts single phase for lighting and three phase and two phase for power.

The lines which are to feed the substations under normal conditions should run by the most direct route, both to save copper and to avoid chance of breakdown, which is almost directly proportional to the length of the line. For emergency lines, however, the direct route becomes unimportant, and the problem consists in getting a system of direct and tie lines which will furnish the emergency service to all substations with the lowest investment.

Two regular feeder lines should, when possible, feed each substation, and they should be on different pole lines or in separate duct lines to increase reliability. On a long line the reliability can be increased by sectionalizing the two feeders in a switching station, so that service can be maintained with one-half of each feeder out of commission. Experience has proven that such sectionalizing permits satisfactory operation with a considerably smaller investment for lines than would otherwise be possible. When one line feeds several stations in succession, reliability of service is increased by sectionalizing through selective relays in each station, rather than by running taps from the line into each station from a continuous line.

For protection against lightning, electrolytic arresters are installed at important stations where expensive equipment is to be protected. In smaller substations, where there is considerable line impedance to the power house, and less expensive apparatus is to be protected, horn gaps are connected directly to ground. A grounded wire above overhead lines is standard practice, and appears to give excellent results.

One large and three smaller plants are operated in parallel. Each of the smaller plants is tied to the larger one through two separate lines, but the smaller plants are not tied together except through the busbars of the main plant. This arrangement permits a flexible control of power-factor and voltage at the various plants, and limits the effects of disturbances from line trouble, lightning, etc. It also facilitates the use of selective relays and simplifies the re-establishment of service in case of interruption. The relays are set so that if the stations break apart, each will carry approximately its normal load. Feeder transmission lines are operated in parallel.

The paper was followed by a moving-picture film showing the installation of a group of heavy 11,000-volt armored cables in trenches under the river from the Brunots Island power plant, in the Ohio River, to the South Shore. The film was explained in detail by D. C. Black, of the Duquesne Light Company.

The paper was discussed by Messrs. Doane, Hunter, Lincoln, Welsh, Criss, Hecker, Turpin, Rowe, Hommel and Stone. One of the main difficulties in operating plants in parallel, it was stated, is the possibility of cross currents, with certain relations between resistance and reactance of the line. Also when the voltage is to be maintained constant at both ends of a tie line, and the load is to be carried from one station a low power-factor is inevitable.

The annual banquet of the Pittsburgh Section was announced for December 12, at the Fort Pitt Hotel. Some novel and sensational features are promised.

November Meeting, New York Section, Illuminating Engineering Society.

Two papers in one evening showed the versatility as well as the interest of C. H. Sharp in the Illuminating Engineering Society. At its New York Section meeting held on November 12, at the Engineering Societies Building, Dr. Sharp first presented his paper on the "Photometry of Gas-Filled Tungsten Lamps" and this effort was of the same high order as his paper of nearly eight years ago on the early types of tungsten lamps. Dr. Sharp stated that the obstacles in the way of measuring the new lamps when using the 1.25-watt lamp standard, owing to differences in the color values, had been overcome by means of filter screens and that steps were under way to supply through the Bureau of Standards at Washington standard screens so that tests throughout the country would be comparable.

The troubles from flicker had not been overcome and the efforts to obtain some uniform divergence brought to light some curious facts. Lamps were tested both upright and pendent at speeds ranging from 60 to 240 revolutions per minute. With the tip upward it was found that the difference in the horizontal candlepower due to flicker showed an extreme variation from 60 to 240 revolutions of 16 per cent whereas with the tip downward this amounted to only 6 per cent. The operating characteristics change during the life of the lamp also, a test on the multiple lamp showing a loss after 800 hours burning of 10 per cent in the horizontal candlepower and a 20 per cent drop in the mean spherical candlepower, this latter being due to the blackening of the bulb. Another feature which makes it hard to obtain accurate results is that the filament sags when under operation owing to the high temperature under which the lamps operate. Dr. Sharp's summary of the results strongly advised the rating of these lamps in lumens per watt and that they be measured in an integrating sphere.

The paper was discussed by Messrs. Rose, Rowlinson, Amrine, Taylor, Keene, Halvorsen and Millar. The discussion brought out that bulb reflections and the convection currents in the lamps were further causes of discrepancies. No one advanced any reason why lamps should not be tested for mean spherical candlepower and rated in lumens per watt, as no one has found as yet a dependable mean spherical reduction factor.

The second paper of the evening, also by Dr. Sharp, was a demonstration of a number of types of commercial daylight lighting equipment, and once more he won praise for original thought. As a preface to the demonstration the effect of colorded lights on colored goods was shown by throwing a spectrum on skeins of different colored worsteds. The different colors in the light were reflected where they touched similar colors of the fabrics except in the purple which reflected both red and blue. Red and blue lights have to be mixed before they are thrown on purple in order to reflect purple.

Most persons in the audience were surprised to find such a large variety of color-matching lamps available, as no less than eight styles were shown using four kinds of illuminants. For color matching there were the Ives gas daylight outfit, the Moore carbon dioxide tube, the intensified arc with blue and red filters and two styles of a new glass developed by the laboratories of the United Gas Improvement Company, one style of this glass being shown with a Welsbach lamp and the other with a tungsten gas-filled lamp. Two other equipments were shown which only approximate daylight, these being gas-filled tungsten

lamps equipped with two kinds of blue-tinted opal globes.

The presentation was of an informal and interesting character and seemed so complete that the discussion did not bring out much of value but rather emphasized the importance of extending the use of these lamps. Norman Macbeth called attention to the fact that when these lamps are installed in dry-goods or similar stores the regular artificial lamps should be installed also, as otherwise people would purchase goods which matched under daylight, but not under artificial light. In answer to a question as to the absorption of the various kinds of lamp equipments, Dr. Sharp stated that all of the equipments tested showed an absorption of over 90 per cent. C. A. Bond stated that the educational value of the lamps shown was so great that he hoped that it would be possible to exhibit them throughout the country.

Western Association of Electrical Inspectors.

Detailed arrangements have already been completed for the tenth annual convention of the Western Association of Electrical Inspectors, which is to be held in Minneapolis January 26 to 28, 1915. Headquarters of the convention will be at the Hotel Radisson. A feature of this year's meeting, new in the history of the organization, will be a program of entertainment for the ladies. An unusually large attendance is expected owing to the fact that the convention will be participated in by the Minnesota Section of the American Institute of Electrical Engineers, the Minnesota Section of the National Contractors' Association, and the Minnesota Section of the American Society of Mechanical Engineers. As many of the members of these organizations are residents of Minneapolis and St. Paul, it is believed that they will all be well represented at the sessions.

The convention committee is made up of active, energetic men who know the trick of making enthusiasm contagious. They are canvassing the situation thoroughly to arouse the interest of electrical men generally in the work of the convention. They feel that, despite the depression due to the war, the attendance is likely to surpass that of all former meetings. Emil Anderson, general chairman of the convention committees, is electrical inspector for Minneapolis Underwriters. Fred G. Dustin, secretary-treasurer, is manager of the Northern Electrical Company of Minneapolis. Mr. Dustin was chosen for this position on account of his reputation as an all-round booster. R. L. Daniels, chairman of the entertainment committee, is electrical inspector for the underwriters of Minnesota and North and South Dakota. Robert F. Pack, chairman of the ways and means committee, is general superintendent of the Minneapolis General Electric Company, and is well known among the electrical men of the northwest. Oscar M. Frykman, chairman of the ladies' reception committee, is chief electrical inspector of the city of Minneapolis. Guy W. See, chairman of the transportation committee, is outside wire inspector for the city of Minneapolis. All the men are actively engaged in the special work of their departments and are determined to make the 1915 convention the biggest ever.

Applications of the Concentrated-Filament Lamp.

With the introduction of the drawn-wire tungsten-filament lamp, operating at a much higher efficiency than the carbon and obtainable in considerably greater capacities, the scope of the incandescent projector was enormously enlarged. Not only were these lamps available in much higher wattages than carbon, but the filaments could be concentrated to a much greater degree. The production of lamps varying from very low to very high candlepowers offers light sources for almost all forms of projection apparatus, and marks the passing of the acetylene and the gas projector in many classes of service. These points were brought out very effectively at the last meeting of the New England Section, Illuminating Engineering Society, held in Boston, November 10. The roof of the Boston Edison Company building was utilized as the base of operations.

At a meeting held in the assembly hall, Dr. Louis Bell presided, and papers were read by Prof. A. E. Kennelly, of Massachusetts Institute of Technology, L. C. Porter, of the General Electric Company, Harrison, N. J., and P. S. Bailey, of the General Electric Company's Lynn works.

Incandescent lamps of type C Mazdas, of 500 and 1,000 watts for stereopticon purposes were shown for the first time, and a reflector which increased the intensity of 1,000 to more than a million candlepower was exhibited.

The field of application of these concentrated-filament lamps is very large, starting with low-voltage units, of which a great number are employed in headlights for automobiles, motor boats, aeroplanes, fire-fighting apparatus, in spotlights, and small searchlights. Although at first one thinks of a six-volt battery lamp as little more than a toy, several thousand of these are now in railroad headlight service—one of the most severe applications that could be specified. The latter are in a standard size of 108 watts capacity and yield over 900,000 candlepower in a 20-inch parabolic reflector of the silver-plated type. Here we have an example of real efficiency, and it is interesting to note that the filament of such a lamp occupies a space only 2.5 millimeters in diameter by 5 millimeters long, compared with 8 by 9 millimeters in a 100-watt, 110-volt stereopticon lamp. The incandescent headlight has many advantages, such as ease of control, steadiness of beam, simplicity and reliability. Tests show that for equal beam candlepowers the incandescent headlight will "pick up" objects at great distances, probably on account of the superior color and steadiness of the source. The use of oil headlights on steam locomotives is seriously threatened by this advance in electrical design and manufacture.

Another large field of application for the low-voltage, concentrated filament is in signal work. The railroads are experimenting with the so-called "daylight position" signal. The indications of these signals are given by three rows of lenses at 0, 45, and 90-degree positions. Each lens is backed by a low-candlepower concentrated-filament lamp, and either the 0, 45 or the 90-degree row is lighted, depending upon whether the signal indicates, "stop," "slow" or "proceed." It is claimed that even under the trying conditions of looking toward the setting sun, it is visible from a greater distance than the regular semaphore blade. Daylight position signals eliminate moving semaphore blades and prevent possible mistakes through color blindness or confusion on the part of engineers, or color changes due to atmospheric conditions. If the trial installations prove as satisfactory as anticipated, this method of electrical signalling is certain to be widely applied and to bring increased business of the most desirable long-hour type to energetic central stations.

Many locomotives are already equipped with 30-volt generator sets, with which arc headlights were previously used. To enable concentrated-filament lamps to be used here, 30-volt lamps have been developed in capacities of 100, 150 and 250 watts. A special lamp of 1,500-candlepower is also available at this voltage, in order to meet the rather extreme law in some states which requires locomotives to carry headlights of the foregoing unreflected candlepower. Another field in which the lamps have been employed is for lightships and range lights, using a low-candlepower highly concentrated filament, backed by a silver-plated parabolic reflector. Such lights have a distinctive color and sparkle

and are visible at great distances. Experiments are also being made with small lamps and dry batteries for heliograph signals. Lamps of about 0.5 candlepower, 2.7 volts, backed by five-inch mirrors, operated by small dry cells, have been successfully read at night without the aid of glasses up to 12 miles. There is little doubt that concentrated-filament lamps are being used in the European War as an aid to the digging of trenches, picking up wounded, burying the dead, detecting the approach of aeroplanes and submarines, blinding the enemy during charges, and assisting troops when attacking.

Aside from the foregoing applications, a great field of service for focussing filament lamps of the concentrated type exists in 105 to 125-volt applications. Such equipment makes a stereopticon safe, simple and clean, so that it can be operated anywhere, by anyone. For the small lantern, sign projector, etc., the 100-watt lamp is ample, the 250-watt size being used in larger auditoriums. For the heaviest service 500 and 1,000-watt lamps have been developed. These should always be used with a spherical mirror, which increases the intensity on the screen at least 30 per cent. The 500 and 1,000-watt lamps are satisfactory for small motion-picture machines, and experiments are under way with reference to the larger sizes of these machines, which, if successful, will largely reduce the fire risk and eliminate synchronism troubles in motion-picture theaters supplied with alternating current. For playhouse lighting, focussing filament lamps are being successfully used as flood and drop lights, and their ease of control and superior service when dimmed are important advantages. The field of exterior flood lighting of buildings is also an application which is in its infancy.

Meeting of Philadelphia Section, Electric Vehicle Association.

The regular monthly meeting of the Philadelphia Section of the Electric Vehicle Association of America was held in the hall of the Philadelphia Electric Company, on the evening of November 11, with Chairman R. L. Lloyd presiding.

Following routine business and reports of committees, the chairman introduced the speaker of the evening, Maxwell R. Berry, of the Electric Products Company, Cleveland, O. The subject of Mr. Berry's address was "Battery Charging."

He discussed some of the phases of vehicle charging that are a little out of the ordinary, showing how special problems, having a bearing on the success of the electric vehicle, have been taken care of in some cases. The speaker divided the subject into three parts or headings, indicating that the charging in the private garage for one or two cars had very different problems from the public garage or the private garage for trucks only. He gave a very careful analysis of all the elements entering into the question, making what has always seemed to be a very complex proposition appear very simple indeed when viewed from the proper angle.

Tapering charges, steady-rate charges and boosting charges were each given attention, and illustrations of suitable apparatus for each variety were shown and explained. Mr. Berry pointed out the fact that for the private passenger-car garage, simplicity and positive results were essential, because the users of this class of vehicle were not inclined to either give the matter much personal attention or to worry over results. The apparatus he recommended for this class was one which required only the insertion of a connecting plug and throwing of a switch, leaving subsequent operation to be entirely automatic. The proper results are much better secured by the use of a motor-generator rather than an arc rectifier, one reason being the nearly constant voltage secured, even though violent fluctuations on the supply line might be present.

In the other two classes of garages, attendants would always be present and the necessity for automatic features would be largely eliminated.

Attention was called at the meeting to the lack of any charging facilities between Camden and Atlantic City, N. J., and to the advisability of making an effort to provide some charging station along the route, preferably at Hammonton, which is just about half way. On resolution a committee was appointed to look into this subject and to make recommendations, with J. C. Bartlett as chairman.

Chicago Section, Electric Vehicle Association of America.

At the luncheon of the Chicago Section, Electric Vehicle Association of America, on November 17, which was also the regular monthly meeting of the section, the subject of "The Best Ways and Means of Promoting the Passenger Electric Vehicle in Chicago," was discussed. J. W. McDowell in opening the meeting offered a suggestion for increasing electric-vehicle sales, namely that truck salesmen knowing of satisfied users consider these as passenger-car prospects and furnish passenger-car salesmen with these names. Likewise satisfied users of electric passenger cars should be considered prospects for the truck where their business demands some means of transportation. Mr. McDowell thought the secretary's office could act as a clearing house for this exchange of names.

Prof. D. P. Morton of Armour Institute of Technology outlined the electric-vehicle course recently inaugurated and explained that the one discouraging feature of the venture is the diversified interests of those applying for instruction. There is no common basis on which the students meet and it is therefore difficult to hold the interests of the students except when dealing with the particular branch of the work of individual interest to each.

D. E. Whipple, of the Anderson Electric Car Company, thought that the greatest hindrance to the sale of electric passenger cars has been the almost universal belief that the electric was only a woman's car. He thought, therefore, that the greatest impetus could be given the electric by advocating it as a man's car. This would counteract the present false impression and serve to rapidly establish the electric vehicle as a truly utility car.

L. E. Hamburg, discussing the subject from the viewpoint of the user, thought that sufficient effort is not expended by salesmen in reaching the men, particularly physicians and other professional men. He also contended that improvements could be made in garaging facilities and service.

George H. Jones called attention to the willingness of the Commonwealth Edison Company to co-operate in the sale and promotion of the electric. He thought that to be universally considered as a man's car the electric must be of simpler design, more nearly approaching gasoline-car design, and be less expensive.

Speaking of the price of electric passenger cars, Mr. Whipple stated that the present price is consistent with the quality of the car and the workmanship necessary to produce it.

D. McRae, of the Commonwealth Edison Company, thought that the manufacturers were responsible for the impression held by many users that the electric needed no attention after once purchased. This belief causes much dissatisfaction and is harmful to the industry. Unless the electric is given proper care it will not give satisfaction and users should be so instructed, rather than led to believe that absolutely no attention is necessary.

The electric is the ideal car for the physician. There is no trouble in starting up and no noise. After seeing his patient to sleep he does not awaken him when starting his motor.

New Electrical and Mechanical Appliances

Fixtures for Gas-Filled Tungsten Lamps.

A new line of fixtures designated by the trade name "Safety Incandescent Arc Fixtures" has been placed on the market. These fixtures have been designed particularly for use with gas-filled tungsten lamps, although serviceable with all high-power incandescent lamps. Six different types of fixtures constitute this new line, and each of these is made for multiple and series circuits. Practically all the fixtures are suitable for either indoor or outdoor use. The designs are varied to meet different requirements. All of the designs provide for ample ventilation. Mogul sockets are used in all cases and these are adjustable vertically with respect to the reflector or globe so as to accommodate different sizes of lamps and permit getting the light distribution desired. For series lamps film sockets are employed and the entire outfit is specially insulated for fairly high voltage. Fixture terminals are porcelain-bushed in all fixtures. All fixtures are provided with either a diffusing globe or reflector, or both; bare lamps are used only in fixtures hung very high in large interiors and then a wide reflector is furnished.

Fig. 1.—New Fixture for Gas-Filled Lamp.

Fig. 2.—Fixture Without Reflector.

Two types of the fixtures are illustrated herewith. Fig. 1 shows an outfit with heavy copper casing and 20-inch white-enameled reflector. The globe is 9-inch by 13-inch crystal-roughed-inside glass. The total height of the fixture is close to 21.6 inches. Fig. 2 shows a fixture with fluted cast-iron casing and 6-inch by 9-inch globe. This can be provided with either a 14 or 20-inch enameled reflector, if desired. It makes a rugged, simple and inexpensive outfit suitable for any size lamp up to 250 watts.

These new fixtures are manufactured by the Electric Operations Company, Bush Terminal, Brooklyn, N. Y.

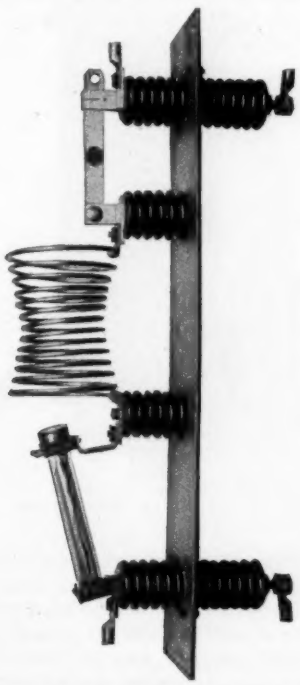
Reliance Time Switch.

Reliance Automatic Time Switch.

The Reliance Automatic Lighting Company, Racine, Wis., has placed on the market a reliable and accurate automatic time switch for turning on and off the current in a circuit at any hour desired with no attention other than a weekly winding of the clock. The Reliance time switch is the invention of Benjamin F. Flegel, president of the company. Mr. Flegel is a pioneer in the development of automatic time switches. The switches are made with open face, exposing the clock for indoor use, and with closed face for outdoor service.

High-Tension Line Unit.

The demand for compact, lower cost and easily installed units for high-tension feeders has been met by a new self-contained line unit. This unit, illustrated herewith, is connected directly in the incoming or outgoing feeder circuits, thus comprising a combined switching, fusing and choke-coil equipment for indoor use.



Compact High-Tension Line Unit.

The fuse is of the chemical form, having a high rupturing capacity, thus affording protection to circuits supplied by the largest generating station. The switch is of the disconnecting form, operated by an insulated hook stick, and the choke coil is of the hour-glass type that forms an effective barrier between the apparatus and incoming surges.

This compact unit is made for all voltages up to 33,000, and furnished in many different combinations of front

and back-connected designs. The steel base is arranged for mounting on either flat surfaces or pipe framework and can be grounded, thus affording absolute safety to the operator. This new line of equipment is manufactured by the Delta-Star Electric Company, Chicago, Ill.

Steward Electric Air Heater.

The practicability of electrically heating bath rooms, physicians' offices and other relatively small apartments at small expense is becoming better appreciated and this has stimulated the demand for electric heaters to suit this purpose. A new type of air heater for this service has been placed on the market by the D. M. Steward Manufacturing Company, Chattanooga, Tenn. A view of this outfit is shown herewith. As can be seen, it is a simple but neat heater in which needless ornamentation has been eliminated.

Electric Heater for Small Rooms.

This heater employs the principle of heating a room by direct circulation of heated air. Air enters at the bottom, passes through two superposed heating elements and issues at the top warm enough to comfortably heat a moderate size room. With both heating units in service the capacity of the heater is 80 cubic feet of air heated to 380 degrees Fahrenheit per minute. A small pan of water for humidifying the air can be placed on top. The heater, of course, is absolutely clean, does not produce odor or noxious fumes and does not vitiate the air of its life-giving oxygen. It is, therefore, greatly preferable to any gas or oil heater, even where the cost of electrical energy is relatively high.

The heating units are of the disk type and consist of Nichrome resistance wire laid in special grooves in a body made of Alberene stone. This is perforated with a large number of holes, giving the air access to the glowing coils; the air is heated not only by direct contact with the resistance wire, but also by its passage through the stone body of the unit. Each unit takes 450 watts. An indicating snap switch at the bottom permits turning on one or both units. The entire heater is well constructed so as to give prolonged service. Although substantially built, it is light in weight and low in price.

A larger form of this electric stove is also made by the same manufacturer. It also has two heating units taking a total maximum of 2,000 watts. Its capacity is heating 240 cubic feet of air per minute, enough for a good-sized room.

An Automatic Drill for Rapid Work.

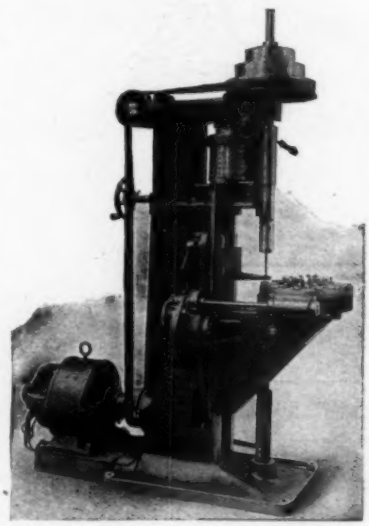
The illustration herewith shows a new type of drilling machine, brought out to fill the need of a machine which would handle work at its maximum rapidity under the conditions of high-speed drilling.

Builders of high-speed drilling machines have been aware for a long time that the maximum time consumed in drilling small holes in a given piece of material is not that consumed by the tool piercing the material, but by the operator in placing the work in position, advancing the tool to the work through the jib bushing or clearance space, engaging the feed, withdrawing the tool, and removing the work. The actual drilling time for a three-fourths-inch drill through a piece of cast-iron three-fourths inch thick, with high-speed drills, should be about four seconds. The average time, including changing work, etc., which is taken to do this work, even with the best high-speed drilling machines, comes nearer being thirty seconds.

After a long period of study and experiment the firm of Baker Brothers, Toledo, O., has developed a machine to perform these operations automatically, consuming the minimum of time. At the same time, the machine is so simple in its construction that changes for different classes of work are very quickly made.

The one-inch automatic drill will drill eight of these holes a minute, including chucking. The feed of the machine is secured by means of cams. This gives a powerful feed with a quick-return feature. It also gives a feed with a dowel at the end, which enables it to be used for facing work in facing to an exact depth. It also gives a feed on which the correct lead can be secured for threading.

Two types of table are provided, the plain table and automatic indexing table. On the plain-table machine, the operator places the work under the drilling spindle and trips the machine with a foot lever, the same as he would a punch press. The spindle advances quickly to the work, the cutting tool passes through the work, withdraws and the feed stops. The operator removes the finished piece of work, places another in position, and trips the foot lever. This enables him to handle work using both hands, thereby securing very rapid production. The revolving table is provided with an automatic indexing motion, which, at the instant the spindle is withdrawn, advances the table to the next position and brings a new piece of stock under the working tool. The period occupied by the withdrawal of the working tool and the indexing of the table is from one to three seconds.



Motor-Driven High-Speed Drill.

In using this machine for chuck work, from six to eight chucks are usually provided on the table, and all that the operator is required to do is to chuck and remove the work, not paying any attention to the operation of the machine other than to see that the tools are kept sharp. Should a drill break, the machine can be instantly stopped at any point. Should it be desirable, the machine can be made to index, skipping any number of chucks that may be desired.

The drill is driven by a 7.5-horsepower adjustable-speed Westinghouse electric motor.

Uses for Black Locust.

Outside of its use for fence posts, black locust finds its principal utilization in insulator pins and brackets for telegraph and telephone lines.

Soldering Torch Employing Compressed Acetylene.

Despite its extensive use by electricians, the shortcomings of the ordinary gasoline torch are generally realized. The difficulty of starting it in windy or stormy weather and the time consumed in starting it on all occasions, the necessity for frequent repumping to maintain steady heat and the danger from the wide flame scorching surrounding objects are some of the more aggravating features connected with its use.

The successful development of oxy-acetylene welding and fusing some time ago directed attention to the possibility of using a simplified form of this method for soldering, brazing and similar operations that require not quite so intense heat. This has been done in a very handy form of torch employing acetylene compressed in the familiar Prest-O-Lite steel tanks.

Fig. 1.—Torch Connected to Acetylene Tank by Tubing.

Fig. 1 shows one of these torches, known as the Style C, which consists of a special burner at the end of a metal tube with handle that is connected by means of heavy rubber tubing with the Prest-O-Lite tank. This particular outfit gives a powerful flame that can be easily regulated by a needle valve for different kinds of work. It has been used successfully for brazing solid steel bars up to two inches in diameter and can be employed for sweating in terminal lugs on heavy cables, for wiping joints on large lead-covered cables, for lead-burning storage-battery tank linings and busbars, for heavy soldering, etc.

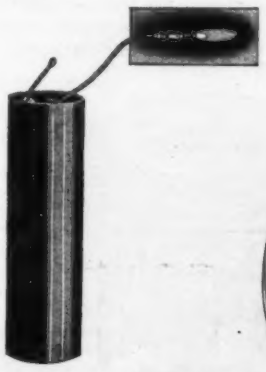


Fig. 2.—Torch Connected Directly to Tank.

The burner consists of a central tube for the compressed acetylene, a number of air inlets and a mixing tube. The mixture of acetylene and air burns with a concentrated flame, having a greenish white cone in the interior. A flame with a short cone is ample for soldering; for brazing and other very heavy work a longer and therefore hotter flame is used. The torch can be instantly lighted and is immediately ready for use.

A smaller acetylene torch, known as the Style A, is shown in Figs. 2 and 3. It consists of the burner or torch proper and two connecting stems, into either of which the burner is screwed. Fig. 2 shows it with the stem coupled directly with the Type MC tank; the other stem is used with the larger sizes of tanks by connecting it with any desired length of one-eighth-inch rubber tubing. Special clamps are used to secure the rubber hose. This size of torch produces a less powerful flame than that shown in Fig. 1; it is especially useful in soldering wires and other similar work. The flame is compact and easily confined to the work in hand. The smaller tanks can be provided with a handle or hook for using with the torch directly in the hand or for hanging over a crossarm or other object.

Fig. 3.—Small Torch and Connecting Stems.

Hipcoscope Flashlight.

These torches have been found very serviceable by the linemen and electricians of telephone and central-station companies. They can also be used to advantage by contractors and wiremen in general. Not only do they overcome the objections met with in the use of the gasoline torch, but it is asserted that they have been found more economical in both first and operating costs.

This type of acetylene torch is sold under the trade name Prest-O-Torch. It is manufactured by The Prest-O-Lite Company, Incorporated, Indianapolis, Ind.

New Mogul Sockets for Gas-Filled Lamps.

In line with the recent development in large-unit lighting, the Arrow Electric Company, Hartford, Conn., has brought out various types of sockets and receptacles for mogul-base lamps, the latest additions to the line being illustrated in the company's catalog supplement recently distributed.

One of these sockets is shown in the accompanying illustration. All of the various types are designed for use with gas-filled high-efficiency tungsten lamps, attention having been paid to the particular conditions governing the use of these lamps.

The new porcelain fixture sockets may be used with fixtures which have already been designed for the earlier type of brass-shell mogul socket, the over-all length being the same in both types. A special sealing compound is used which hardens with the application of heat.

Mogul Porcelain Socket.

A New Flashlight.

The Hipwell Manufacturing Company, Pittsburgh, Pa., has recently put on the market a new type of flashlight, which has the distinction of possessing an effective range of 200 feet. In appearance, the Hipcoscope (the name under which this new type of flashlight is being sold) does not differ greatly from the so-called miner type of flashlight. All improvements were made with a view to producing greater efficiency from the miniature tungsten lamp which is employed. The Hipcoscope is fitted with two high-power lenses which concentrate the light and project it with the aid of a true parabolic reflector in the desired direction.

The manufacturer states that some

very remarkable results have been achieved with this flashlight. The Hipcoscope is made in two sizes, one weighing one pound and another weighing 10 ounces.

The Hipwell Manufacturing Company has recently enlarged its manufacturing facilities in order to supply the demand anticipated for this new type of flashlight and states that, while well represented in most parts of the United States and Canada, it has still some good territory open to responsible electrical supply houses to whom a very attractive proposition will be made.

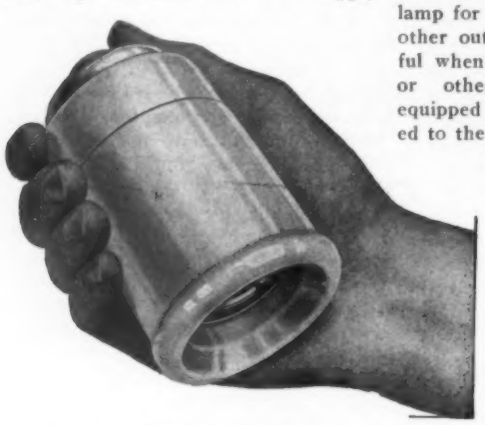


Fig. 1.—Bryant Mogul Socket.

New Bryant Fittings.

A large number of new sockets, receptacles, switches and other fittings have recently been developed and placed on the market by the Bryant Electric Company, Bridgeport, Conn. A few of these are shown herewith.

Fig. 2.—Flat-Back Ceiling Receptacle.

Fig. 1 gives a good idea of a new and very rugged mogul socket for use with the largest gas-filled tungsten lamps, ranging at present up to 1,000 watts, that are rapidly coming into use where a powerful and efficient light source is desired. This socket is built for the most severe service. Its live parts are sealed in with a compound, which, it is claimed, will not soften under any degree of heat to which it may be subjected in service.

A new type of pull-chain twin socket is shown in Fig. 3. This socket is made in two types. In one type both outlets are simultaneously put on or off by successive pulls of the chain. In the other type the straight outlet alone is affected when the chain is pulled, the lamp in the angle outlet being on all the time. The first type is useful where it is desirable to turn on and off two energy-consuming devices at the same time or where one outlet holds a lamp which serves as a pilot lamp for an appliance connected to the other outlet. The second type is useful when it is desired to have a lamp or other energy-consuming device equipped with its own switch connected to the angle outlet. A shade-holder can be attached to either outlet and can be held in its normal position relative to the lamp. In place of the cap shown, these sockets are also provided with a screw-plug cap so that they may be inserted in any ordinary socket like any attachment plug.

Fig. 3.—Twin Pull Socket.

A ceiling receptacle with a flat back designed for use with 3.25-inch and 4-inch outlet boxes and for surface installations is shown in Fig. 2. The diameter at the base is 4.625 inches. Holes for supporting screws are spaced 2.75 and 3.5 inch on centers. The porcelain base insulates the shell from the wall or box. A threaded bead is provided for the new threaded type of shade-holders that are becoming very popular.

Figs. 4 and 5 show different views of a new two-part sign receptacle which goes into a 1.375-inch hole and requires no lug or slot to prevent it from turning. It is prevented from turning by three fins on the front portion of the porcelain, which bite into the metal of the sign as the two portions of the receptacle are brought together with the center screw. The latter does not come into direct contact with the center contact of the lamp and therefore there is no tendency for the screw to loosen by friction of the lamp on the screw-head.

The entire front portion of the receptacle can be removed and replaced without disturbing the line connections. Since the receptacle goes into a perfectly smooth hole, it can be set in any desired position and then be prevented from turning as described.

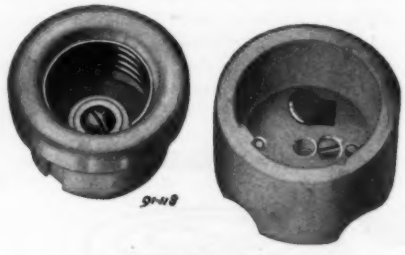


Fig. 4.—Two-Part Sign Receptacle.

United States Almost Independent in Mineral Resources.

Probably no other nation in the world so nearly approaches absolute independence in respect to mineral resources as the United States.

A glance at the statistics of mineral imports affords a means of comprehending in a broad way how great and complex is the task of attaining national independence in the mining, metallurgical, and chemical industries. Last year the imports of mineral products, both crude and manufactured, exceeded $270,000,000. Of this total probably $200,000,000 represents raw materials and crude metals, the value of these imports being about 8 per cent of that of the domestic output. In this list of imports the larger items named in the order of value are unmanufactured copper, precious stones, nitrate of soda, copper ore and matte, nickel, tin, iron ore, pig iron and steel, petroleum products, manganese ores and alloys, platinum, aluminum, pyrite, graphite, stone, potash, and magnesite.

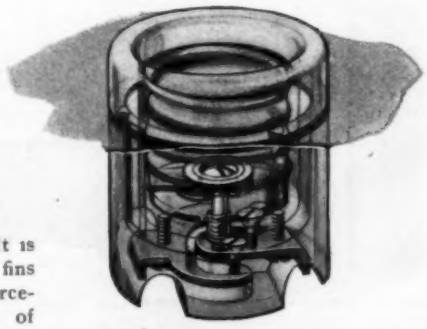


Fig. 5.—Skeleton View of Receptacle.

This country has an abundant supply of most of these mineral products that are now imported in large amounts, and as to them it can be independent of foreign countries. The only essential minerals of the first rank of which the United States has no known supply at all commensurate with its needs are nitrates, potash salts, tin, nickel, and platinum.

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

CONDUIT BOXES, Floor Outlet.—Frank Adam Electric Company, 904 Pine Street, St. Louis, Mo.

"P. O." floor outlet boxes, catalog No. M-50.

Iron boxes with floor plate and nozzle, or face plate for wall outlets.

Approved September 17, 1914.

CONDUIT, Miscellaneous. — Fibre Corporation, Madison Avenue and Forty-first Street, New York, N. Y.

"J-M" fiber conduit. Standard for use only in central stations and when laid in concrete for its entire length.

Approved August 29, 1914.

CONDUIT OUTLET BUSHINGS, COUPLINGS AND FITTINGS.—The Gillette-Vibber Company, 32 Maple Avenue, New London, Conn.

"Gee-Vee." Armored cable or flexible tubing connectors for use with standard outlet boxes with knockouts for one-half-inch conduit, and consisting of a cast or sheet-steel sleeve for holding the cable or tubing to be secured to the outlet box by an outer flange and an inner bushing-lip and taper-headed screw.

Catalog Nos. 731, 734, 738.

Approved October 16, 1914.

COVERS, for Conduit Boxes.—Benjamin Electric Manufacturing Company, 120 South Sangamon Street, Chicago, Ill.

"Benjamin," stamped-steel galvanized covers for mounting lamp receptacles on round outlet boxes, and are supplied with additional brass shadeholder covers.

Catalog Nos. 3623, 3623-B, 3624, 3624-B, 36233, 36235, 36243, 36245.

Approved October 8, 1914.

PROTECTORS. — Reliable Electric Company, 411 South Sangamon Street, Chicago, Ill.

Carbon arrestors with wood tube inclosed fuses, on porcelain bases.

Catalog No. 991, with sheet-metal cover.

Catalog No. 997, inclosed in porcelain case with flanged cast-iron cover and rubber gasket.

Catalog No. 998, with adjustable air gap.

Catalog No. 999, with adjustable air gap and heat coils.

Approved October 17, 1914.

RECEPTACLES, Candelabra and Miniature.—The Arrow Electric Company, 103 Hawthorne Street, Hartford, Conn.

"Arrow E," 75 watts, 125 volts.

Candelabra sign, catalog No. 388.

Approved October 15, 1914.

SOCKETS, Standard.—General Electric Company, Schenectady, N. Y.

"G. E."

Key, catalog Nos. GE372, GE374, GE376.

Keyless, catalog No. GE377.

Also the above types with shadeholders attached.

Approved October 5, 1914.

SOCKETS, Weatherproof.—General Electric Company, Schenectady, N. Y.

"G. E. Co."

1500 watts, 250 volts.

Catalog Nos. GE518, GE519, GE520.

Approved October 12, 1914.

SWITCHES, Pendant Snap.—The Bryant Electric Company, Bridgeport, Conn.

"Bryant" or "Perkins."

Two-button type.

Single-pole, 5 amperes, 250 volts, 10 amperes, 125 volts, catalog Nos. 2353, 2354, 2359; 3 amperes, 250 volts, 6 amperes, 125 volts, catalog Nos. 2250, 2270, 2370.

Single-button type.

Single-pole, 5 amperes, 250 volts, 10 amperes, 125 volts, catalog Nos. 2440, 2464, 2495, 2501, 2544, 2545.

Double-pole, 10 amperes, 250 volts, catalog Nos. 2421, 2454, 2469, 2490, 2498, 2504, 156761.

Three-way, 5 amperes, 250 volts, 10 amperes, 125 volts, catalog Nos. 2417, 2465.

Four-way, 2 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 2418, 2466.

Two-circuit, 2 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 2419, 2419-A, 2467, 2496, 2502.

Three-circuit, 2 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 2420, 2468, 2497, 2503, 156762.

Two-speed, 5 amperes, 250 volts, 10 amperes, 125 volts, catalog Nos. 2422, 2470, 2499, 2505.

Three-speed, 5 amperes, 250 volts, 10 amperes, 125 volts, catalog Nos. 2423, 2471, 2500, 2506.

Approved October 2, 1914.

SWITCHES, Push Button Flush.—The Bryant Electric Company, Bridgeport, Conn.

"Bryant" or "Perkins."

Single-pole, 5 amperes, 250 volts, 10 amperes, 125 volts, catalog Nos. 2201, 2295, 2457, 2491, 2519, 2522, 2525.

Double-pole, 10 amperes, 250 volts, catalog Nos. 2202, 2298, 2462, 2494, 2520, 2523, 2526.

Three-way, 5 amperes, 250 volts, 10 amperes, 125 volts, catalog Nos. 2203, 2296, 2458, 2521, 2524, 2527.

Four-way, 5 amperes, 250 volts, 10 amperes, 125 volts, catalog Nos. 2204, 2297.

Four-way, 2 amperes, 250 volts, 5 amperes, 125 volts, catalog No. 2459.

Two-circuit, 2 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 2460, 2492.

Three-circuit, 2 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 2461, 2493.

Emergency switch for signal system, catalog No. 488.

Approved October 2, 1914.

SWITCHES, Rotary Flush.—The Bryant Electric Company, Bridgeport, Conn.

"Bryant" or "Perkins."

Single-pole, 3 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 2093, 2205, 2340, 2346.

Single-pole, 5 amperes, 250 volts, 10 amperes, 125 volts, catalog Nos. 2094, 2206, 2341, 2347.

Double-pole, 10 amperes, 250 volts, catalog Nos. 2095, 2207, 2344, 2350; 30 amperes, 250 volts, catalog No. 2568; with plate catalog No. 2569.

Three-pole, 15 amperes, 250 volts, catalog Nos. 2085 and 2125 (Vulcabeston commutator).

Three-way, 3 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 2096, 2325.

Three-way, 5 amperes, 250 volts, 10 amperes, 125 volts, catalog Nos. 2097, 2208.

Four-way, 2 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 2098, 2209.

Two-circuit, 2 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 2218, 2224, 2342, 2348.

Three-circuit, 2 amperes, 250 volts, 5 amperes, 125 volts, catalog Nos. 2099, 2210, 2343, 2349.

Also above types with lock attachment.

Approved October 2, 1914.

SWITCHES, Rotary Flush.—Chapman & Walker, Limited, submitters, 118 Richmond Street, West, Toronto, Can.

Manufactured by The Sterling Telephone & Electric Company, Limited, Telephone House, 210 Tottenham Court Road, London, Eng.

Three-way, 5 amperes, 125 volts, 3 amperes, 250 volts, catalog No. A-163.

Approved October 12, 1914.

TRANSFORMERS. — Thordarson Electric Manufacturing Company, 501 South Jefferson Street, Chicago, Ill.

Air-cooled transformers with sheet-metal cases for indoor or outdoor use with electric signs. Primary volts 110 to 220, secondary volts 10, capacities 250, 500, 750 and 1000 watts.

Approved September 9, 1914.

Current Electrical News

NORTH ATLANTIC STATES.

TURNERS FALLS, MASS.—The Franklin Electric Light Company of Turners Falls and the Montague Electric Light & Power Company of Montague have petitioned the Gas and Electric Light Commisssion for approval of a proposed consolidation whereby the Franklin Company shall purchase the property and franchise of the Montague Company and take over its entire electric light and power business.

BRIDGEPORT, CONN.—The city lighting committee has begun work on the extension of the ornamental arc light system and it is expected that the system will be installed before Christmas. The work is to cost between $30,000 and $40,000. Charles D. Davis and J. H. Stagg are members of the aldermanic committee in general charge of the installation.

NEW HAVEN, CONN.—The city electrical inspection department has been investigating street conditions with a view to eliminating all overhead wires and placing the distribution system underground.

EDWARDS, N. Y.—The Edwards Electric Light Company has made arrangements with the Watertown Light and Power Company for power to be furnished from its South Edwards plant. The line now passes through the village leading to the Northern Ore Company's mill and the connection can be easily made. This will give a 20-hour service. Flat rates will be discontinued and meters will be installed. The company's power house will be maintained for emergency use.

WATERTOWN, N. Y.—The town boards of Wilna and Diana will hold a joint session at the Central House on November 24 to decide on the proposition to set off a light district which includes the village of Natural Bridge and surrounding territory and to make contract with the Watertown Electric Light & Power Company for the lighting of the streets, roads, public buildings and residences in the lighting district.

CENTER VALLEY, PA.—Work will begin immediately by the Coopersburg (Pa.) Electric Light and Power Company upon the construction of a line from the Coopersburg substation of the Lehigh Valley Transit Company to Center Valley, a distance of two miles, to supply that town with light and power. Up to the present time, about 35 prospects have been signed up. C. H. Stoneback is manager of the company.

HASTINGS, PA.—At the recent election the citizens voted in favor of issuing bonds to the amount of $32,000 for the establishment of a municipal electric light plant.

LANSFORD, PA.—Valley Electric Light, Heat and Power Company has filed notice of increase of stock from $10,000 to $80,000.

NORTH CENTRAL STATES.

CINCINNATI, O.—Architects Tietig & Lee, of Cincinnati, have plans and specifications for the new chemistry building of the University of Cincinnati, on the electrical work in which the Board of Directors will receive bids until noon on December 1.

GLOUSTER, O.—The village has sold bonds to the amount of $4,000 for the purpose of providing funds for improvements to the light and water plant. L.

NEW PALESTINE, IND.—The town council has granted a franchise to the Indianapolis & Cincinnati Traction Company to supply electric current for lighting, and has contracted for street lights.

LEWISTON, ILL.—W. H. Parlin of Canton, who is the owner of the Canton Gas and Electric Company, has purchased the plant of the Lewiston Electric Company. Improvements will be made.

FENTON, MICH.—At a meeting of the common council all bids for the boulevard lighting system were rejected. A resolution was passed for Fenton to buy its own material and have its own laborers do the work of installing the system. The work will be under the supervision of Village Electrician E. A. Lockwood.

STURGIS, MICH.—A committee of five, three members of the council and two citizens of Hudson, were appointed by the mayor to investigate plans and means for the building of a municipal electric light plant. The committee consists of Alderman Harie, Garrison, Lautenheiser and C. B. Stowell and James Moloney.

MADISON, WIS.—An order has been issued by the Railroad Commission which fixes the amount which the village of Prairie du Sac must pay to the Prairie du Sac Mill and Light Company for its plant at $5,000, together with an added amount to be agreed upon for extra materials on hand.

SHEBOYGAN, WIS.—The Milwaukee Northern Electric road will construct a power station at Belgium, Osaukee county, which will furnish electric light and power to the villages and farms. Plans for the substation have been completed and arrangements have been made to furnish electric current for light and power for Belgium, Random Lake, and a number of other villages, as well as for the farmers along the various lines running from the substation.

SHEBOYGAN, WIS.—Eastern Wisconsin Telephone Company has been granted the privilege of installing underground wires in the village of Elkhart Lake, according to action taken by village board. There will be 1,200 feet of wires laid in the center of the village, and poles will be taken down.

HIBBING, MINN.—Contract has been awarded to the Home Electric Company for a transmission line, to be extended to the town of Alice, at a cost of $7,200.

MINNEAPOLIS, MINN.—At its last meeting, November 13, the Minneapolis city council directed the city clerk to advertise for bids on street lighting for 1915. The council is to make an effort to have half the cost of maintaining ornamental street lights assessed against the benefited property. To that end the city attorney was directed to prepare a bill for presentation at the meeting of the legislature in January vesting the council with the right to make such assessment for street lighting.

TRENT, S. D.—Ways and means are being planned for installing an electric light system in Trent. It has been decided not to install a municipal plant. A franchise will be granted to a stock company. Address village clerk.

SOUTH OMAHA, NEB.—The lighting contract of the city with the Omaha Electric Light and Power Company has expired. The company proposes to entirely reorganize the present lighting system so that better lights will be furnished and will then make a five-year contract.

SOUTH CENTRAL STATES.

CORBIN, KY.—At a recent election the proposed bond issue to provide for municipal ownership of the electric light plant, was carried. L.

NEWPORT, TENN.—At a recent election a bond issue amounting to $5,000 for equipping the electric light system, was carried. L.

FLORENCE, ALA.—The Lauderdale and the Allentown Power companies have been consolidated by an agreement filed with Probate Judge Koonce. The new company has a capital stock of $400,000. It retains the name, Lauderdale Power Company and its purpose is to develop hydroelectric power in Cypress and Shoal Creeks. The officers of the new company are: Sloan Jacobs, president; Alan Jemison, vice-president; Thurston H. Allen, secretary and general manager; T. W. Pratt, treasurer.

ORANGE, TEX.—The plants of the Orange Ice, Light and Water Company have been purchased by W. H. Stark. He will enlarge and otherwise improve the electric light and power plant. D.

SEGUIN, TEX.—Improvements will be made to the municipal light and water plant at a cost of about $20,000. Bonds for the purpose have been issued. D.

WESTERN STATES.

POCATELLO, IDAHO.—H. J. Craven, former city engineer of Ogden, Utah, Dr. Sidney W. Badcon, and others, recently organized and incorporated the Grand

Canyon Canal & Power Company for the purpose of developing power sites on the John Day River, which is located in eastern Idaho and western Wyoming. The concern is capitalized at $200,000, and Ogden, Utah, is named as principal place of business. The organization has announced its intention of becoming engaged in hydroelectric power business, operating several electric light plants and transmission lines in both Idaho and Utah. Several capitalists of this city are named as stockholders. O.

NOME, ALASKA.—The Seward Peninsula Power Company, which supplies light, heat, power and fire protection to Nome and vicinity, plans the immediate expenditure of thousands of dollars, for power house improvements and extensions. A. J. McConnell, general manager of the company, with headquarters at Nome, is in the East at this time, completing financial arrangements. O.

SPOKANE, WASH.—Petitions involving the expenditure of $110,000 in the lighting of Sprague Avenue, from Division to Cedar Streets and Trent Avenue from Division Street to Lincoln Street, with an artistic electrolier lighting system, will be filed with Commissioner of Public Utilities C. M. Fassett, in the immediate future, as practically all of the property owners and residents in this section of the city have requested that the improvement be made. O.

SPOKANE, WASH.—Residents and property owners on First Avenue have peitioned C. M. Fassett, Commissioner of Public Utilities, to extend the First Avenue electrolier lighting system two blocks further west, or from Cedar to Maple Streets, on First Avenue. Commissioner Fassett advised the petitioners that the extension will be made, but not until the First Avenue system, now being installed, is now in operation. O.

TACOMA, WASH.—At a meeting of the city council recommendation was made for extensive lighting plans for immediate placing in various parts of the city.

HUBBARD, ORE.—According to advices recently received from Portland, the Portland Railway, Light and Power Company contemplates installing an electric lighting and power system in Hubbard, competing with the Molalla Electric Light Company, of Canby, Ore., which now supplies the city with current. O.

OCEANSIDE, CAL.—The South Coast Land Company has opened negotiations with the Oceanside Electric Company to extend light and power wires to South Oceanside and Carlsbad, to which sections the land company is carrying water for irrigation and domestic purposes from the San Luis Rey River.

OAKLAND, CAL.—The sum of $1,550 has been appropriated from the general fund to purchase underground cable for the use of the electrical department.

SAN FRANCISCO, CAL.—Bids are being taken by the board of public works for furnishing and installing equipment in the civic center power plant at McAllister and Larkin Streets. The estimated cost is $16,000.

SAN FRANCISCO, CAL.—Mission Street Merchants' Association has received pledges of $6,000 from property owners along Mission Street toward the $10,000 fund required for a new lighting system.

STOCKTON, CAL.—The city council will advertise for bids for nitrogen-filled tungsten lamps to displace the present illuminants in the city street lighting system.

TULARE, CAL.—A committee from the Merchants' Association has presented plans to the City Council for an elaborate system of electroliers for the business district, and the council has passed a resolution of intention of carrying them out. They call for 50 lights and the laying of about 8,000 feet of conduit.

PROPOSAL.

INTERIOR LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, Washington, D. C., until December 19, for interior lighting fixtures for equipment of the United States post office at Ishpeming, Mich. Drawings and specifications may be obtained from the custodian of site at Ishpeming, Mich., or at the office of the supervising architect.

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained by writing (mentioning file number) to the Bureau of Foreign and Domestic Commerce, Washington, D. C., or to the nearest of its branches at Boston, New York, Atlanta, Chicago, New Orleans, Seattle and San Francisco.]

NO. 14,416. ELECTRICAL MATERIALS.—An American consular officer in the United Kingdom has been furnished with a list of electrical articles which are finding ready sale in that country. The commodities specified are electrical cables insulated with vulcanized rubber, hard-drawn copper wire, pocket flash lamps and similar goods, opal-glass shades, enameled-iron shades, dry batteries for telephone and other purposes, arc-lamp carbons, and electric incandescent lamps. It is explained that the incandescent lamps for the English trade should be provided with bayonet shells; the screw shells used in America are not in favor. There is also a demand for electrical cooking devices.

NO. 14,422. ELECTRICAL MATERIALS.—A firm in the United Kingdom informs an American consular officer that it is in the market for all classes of opal, glass, and enameled-iron shades, insulating materials, such as black adhesive tape, half-proofed tape, Chatterton's compound, shellac, manilla paper tape, suitable for use in the manufacture of electric cables. The firm is also a buyer, in large quantities, of electric porcelain insulators. The company manufactures all classes of vulcanized rubber and bitumen cables, electric-light flexibles, etc.

FINANCIAL NOTES.

The Philadelphia Company has sent out the following notice to stockholders, signed by C. J. Braun, Jr., secretary: "In order to avoid inconvenience and expense, both to yourself and to the company, we have arranged to obtain funds from an outside source, with which to purchase its common stock dividend scrip issued November 2, 1914, to the holders of 10 shares and under, provided the said scrip is rendered immediately."

The first-mortgage, five-per-cent bonds of the Detroit Railway Company, amounting to $50,000, which mature on December 1, will be paid on that date at the People's State Bank, of Detroit, by the Detroit United Railway Company. This is part of an original issue of $1,650,000 bonds dated 1895, $50,000 of which mature annually, beginning with December 1, 1912, for a period of twelve years. A sinking fund will provide for the retirement of the remaining bonds at their maturity in 1924, after the first $600,000 have been paid.

Dividends.

	Term.	Rate.	Payable.
American Railways, com.	Q	1.25%	
Baton Rouge Elec., pf.	S-A	$3.00	Dec. 1
Middle West Util., pf.	Q	31.50	Dec. 1
No. Texas Elec.	Q	1.75%	Dec. 1
Philadelphia Elec.	Q	1.75%	Dec. 15
Wash. Ry. & Elec.	Q	1.75%	Dec. 1
Wisconsin Edison	—	$1.75	Dec. 1

PERSONAL MENTION.

PROF. L. H. HARRIS, who was formerly associate professor of electrical engineering in the University of Pittsburgh, Pittsburgh, Pa., has been appointed consulting engineer to the Public Service Commission of Pennsylvania.

MR. THOMAS E. MITTEN has been elected president of the Philadelphia Rapid Transit Company to succeed the late Charles O. Kruger. Mr. Mitten has for some time been chairman of the company's executive committee and was formerly president of the Chicago City Railway Company.

JUDGE JOHN W. KEPHART, of Ebensburg, Pa., has resigned as president of the Ebensburg Light, Heat & Power Company after having been head of the concern for the past 12 years. No successor has been named, but this will be done at the next meeting of the stockholders.

MR. IRVING SAMUELS has been appointed engineer of distribution of the Lehigh Valley Light and Power Company with headquarters at Allentown, Pa. The rapid increase of business and growth of territory has necessitated the creation of a separate department to handle the electrical distribution and its allied branches.

MR. GEORGE MILLORD, formerly in the sales department of the Lehigh Valley Light and Power Company at Allentown, Pa., has been appointed manager of the Catasauqua, Pa., office of the same company. Up to January 1, 1914, the Catasauqua property was owned by the Lehigh & Northampton Gas and Electric Company, the electrical division of which was taken over by the Lehigh Valley Light and Power Company on the above date.

MR. A. W. SCHOEPF, formerly of Minneapolis, is to have charge of the construction of a large substation and a number of transmission lines at Eureka, Utah, for the Utah Power and Light Company, Salt Lake City. Mr. Schoepf recently completed construction work on a 33,000 horsepower hydroelectric plant, with transmission voltage of 130,000, and the reconstruction of an 18,000-horsepower plant for the Phoenix Construction Company, Grace, Idaho.

MR. WILLIAM H. McKINLOCK announces that he has resigned from the presidency of the Metropolitan Electrical Supply Company, Chicago, and will engage in the manufacturers' agency business. Mr. McKinlock has been associated with the electrical industry for the past 30 years and is one of the best known men in the elec-

trical supply business in the country. He will establish offices in the business district of Chicago, his headquarters for the present being at 635 Waveland Avenue. Mr. McKinlock is arranging to represent the lines of several prominent manufacturers of standard electrical specialties and will be pleased to get in touch with others to complete his list of representations.

MR. OWEN R. JONES, for the past 12 years chief electrician at the plant of the Youngstown Sheet & Tube Company, resigned on November 1 to take up his new duties as electrical superintendent and master mechanic of the Youngstown Iron & Steel Company at its new open-hearth plant now under construction at Lowellville, O. The fellow employees in the electrical department presented Mr. Jones with a solid gold watch, chain and charm, cigars and a gold-mounted fountain pen. Mr. Jones was one of the most popular department heads in the big sheet and tube mills, all of the men in the electrical department being very greatly attached to him because of his fair and courteous dealings with every grade of employee. Mr. Jones was recently elected president of the Association of Iron and Steel Electrical Engineers.

OBITUARY.

MR. PAUL SEILER, a pioneer electrician of the Pacific Coast, died at the home of his daughter in San Francisco on November 7, after a long illness. He was prominent in the electric appliance business of that city for over 40 years. His inventions included an improved key for transmitting wireless messages, block signals for railroads and semaphore signals. He was born in Berlin, in 1845. In 1879 he organized the American Speaking Telephone Company in San Francisco and installed 2,500 telephones. He was one of the organizers and directors of the Mechanics' Bank, a director of the German Hospital, for 12 years was president of the Pierce Hardware Company in Oakland, and owner of the Paul Seiler Electrical Works.

DATES AHEAD.

American Physical Society. Chicago, Ill., November 27 and 28. Secretary, A. D. Cole, Columbus, O.

American Society of Refrigerating Engineers. Annual meeting, New York City, November 30-December 1. Secretary, W. H. Ross, New York, N. Y.

American Society of Mechanical Engineers, New York, N. Y., December 1-4. Secretary, Calvin W. Rice, 29 West Thirty-ninth Street, New York, N. Y.

American Institute of Chemical Engineers. Seventh annual meeting, Philadelphia, Pa., December 2-5. Secretary, J. C. Olsen, Polytechnic Institute, Brooklyn, N. Y.

American Mining Congress. Seventeenth annual session, Phoenix, Ariz., December 7-11. Secretary, J. F. Callbreath, Denver, Colo.

Electrical Supply Jobbers' Association. Quarterly meeting, Tutwiler Hotel, Birmingham, Ala., December 8-10. Secretary, Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

American Association for the Advancement of Science. Annual meeting, Philadelphia, Pa., December 28, 1914, to January 2, 1915. Secretary, L. O. Howard, Washington, D. C.

Western Association of Electrical Inspectors. Annual meeting, Minneapolis, Minn., January 26-28, 1915. Secretary, W. S. Boyd, Chicago, Ill.

With the Electrical Manufacturers

The Holophane Works of the General Electric Company, East Cleveland, O., has ready for distribution catalog No. 90, illustrating and describing Ivanhoe "C" line fixtures for multiple Mazda lamps.

Habirshaw Wire Company, Yonkers, N. Y., has removed its sales office to its general headquarters at the Yonkers works. The company believes that by bringing together in one place all departments of its business, these will be kept in closer touch, which will result in prompter and more efficient service to all its customers.

Allis-Chalmers Manufacturing Company, Milwaukee. Wis.. has issued bulletin No. 1088, which deals with distributing transformers and supersedes an earlier publication on this apparatus. The latest developments in these transformers are described and illustrated. Bulletin No. 1089 described the company's reversing-motor planer drive. Parts of the equipment, as well as complete installation are described with the aid of several views of each.

Cooper Hewitt Electric Company, Hoboken, N. J., has issued two interesting booklets. "Light and Your Eyes" is the title of a very compact treatise on the effect of illumination on the eye, and written for the benefit of the workingman. The subjects of the best kind of light for work, glare, and the effect of red and blue rays on the eyes are discussed in a practical manner. "What Users of Cooper Hewitt Light Say About It" is the title of another folder in which some interesting experiences are given by the users of Cooper Hewitt lamps, particularly with reference to the preference of workingmen for this form of illumination, after overcoming the initial prejudice held by some.

The Smith & Hemenway Manufacturing Company, Incorporated, 150 Chamber Street, New York, is distributing a booklet describing and illustrating its comprehensive line of Red Devil tools for electricians. This is a particularly seasonable suggestion, as the idea of giving thoroughly reliable tools of this description to friends and employees as Christmas gifts is growing in popularity. The variety of Red Devil tools is so great that practically every possible suggestion for a useful gift may be made out of a selection from this booklet.

The General Devices & Fittings Company, Chicago, Ill., has prepared a wall flyer No. 3, describing and illustrating high and low-tension station devices. This gives the station engineer a remarkable amount of information in compact and easily preserved form. There are 63 distinct and separate pieces of apparatus described and illustrated relating to bus bar supports, malleable iron fittings, insular pins, clamp-type supports, contact fittings and low-tension switches and disconnect-type switches.

The Century Electric Company, Nineteenth and Pine Streets, St. Louis, Mo., has published a pamphlet containing a handsome illustration of the one-sixth horsepower, 60-cycle, 1,750 revolutions - per - minute, single-phase, alternating-current motor. Some of the interesting features of this motor are as follows: It starts under full load on a three-ampere fuse; it requires a starting current less than three times full load current; it develops a starting torque of not less than three times full load torque; it is especially adapted to remote or automatic control; it is wound with interchangeable 104-208-volt connections; it is equipped with a detachable base which is provided with slots as well as drilled holes for mounting.

The General Electric Company, Schenectady, N. Y., has issued a new series of bulletins relating to several distinct types of electrical apparatus. Bulletin No. 40500 is devoted to a description and illustrations of the recent improvements made by the company in alternaters for direct connection to steam, oil and gas engines. Bulletin No. 41500 describes the company's small direct and alternating-current motors of the drawn-shell type. These are all fractional horsepower motors which have been especially designed for application to diversified forms of small machines, and range in capacity from one-thirtieth horsepower to one-quarter horsepower, inclusive, and may be wound for either direct or alternating current. Bulletin No. 44404 describes a new line of ventilated, commutating pole motors with a rated capacity of 80 horsepower on 600 volts; due to special features of induced ventilation this type of motor, the company

states, has a greater service capacity than motors of the closed type having the same hourly rating. Bulletin No. 48015 illustrates and describes the type "M" transformer for operating the electric stop-motion of textile machinery.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued, among other new publications, leaflet No. 3749, covering Westinghouse synchronous booster converters, in which this type of apparatus is fully described and illustrated; its advantages are given together with a detailed account of the method of operation and construction details. "Westinghouse Electric Motors for Machine Tool Service" is the title of a comprehensive pamphlet, with art cover, which is profusely illustrated and describes the electrification of a machine shop, going into some detail as to the type of motor to be selected for each machine and giving a recital of the characteristics of direct-current and alternating-current motors as applied to this work; many machine tools with motor drive are shown from actual installation views; there are also included a number of tables showing the relation between feeds, cutting speeds, diameters of work, relation between area of cut in square inches and cutting speed in feet per minute and amount of horsepower required for various machines. "Central-Station Power in Coal Mines" is the title of a pamphlet which deals with the subject of electric power for coal mines and shows the advantages to be gained by the operator from using the power from central-station plants; a number of tables are given showing the cost of operation; curves are also given showing the day and night load in the mine. "Helping the Woodworker" is the title of an attractive little advertising pamphlet that gives in conversational form arguments for the use of motor drive in woodworking plants; following the familiar series of "Joe and the General Manager" advertisements on railway apparatus, use is made of the manager of the woodworking plant and a Westinghouse salesman. Textile Quarterly No. 8, just issued by the company, contains a reprint of a paper by A. E. Rickards in the *Electric Journal* on the "Situation Before the Cotton Textile Manufacturers"; the paper is a thorough discussion and analysis of the cotton textile industry with regard to expense of operation and profits to be derived therefrom; a number of tables of data are given, as well as curves showing the proportion of different kinds of power used to drive these mills. Folder 4287 on electric drive for flour mills contains many curves showing the energy used in various types of these mills and describes equipment suitable for this purpose. Folder 4152 deals with Westinghouse sewing-machine motors, their application and operation. Folder 4286 covers insulating tapes and splicing compounds.

Record of Electrical Patents.

Issued by the United States Patent Office, November 10, 1914.

1,116,369 and 1,116,370. Starter for Engines. V. Bendix, Chicago, Ill. Gear and spring connection between starting motor and engine.

1,116,402. Conductor Wire Reeling Mechanism for Telephones. C. W. Ferguson, Bower, W. Va. Desk set with reel for winding slack cord.

1,116,407. Range and Deflection Transmitter. E. Friedrick, U. S. Navy. Electrically operated.

1,116,418. Time-Controlled Coasting-Indicating Device for Cars or Trains. W. A. Hall and C. W. Hall, assignors to Railway Improvement Co., New York, N. Y. Begins to record when power is cut off the traction motors and ceases when brakes are applied.

1,116,424. Induction Motor. R. E. Hellmund, assignor to Westinghouse Electric & Mfg. Co. Main end rings and auxiliary rings permanently connect the rotor bars into two sets of equal groups.

1,116,430. System of Electrical Distribution. R. P. Jackson, assignor to Westinghouse Electric & Mfg. Co. Opening of the generator circuit-breaker due to overload causes the field strength of the exciter to be weakened.

1,116,432. Regulator for Electric Circuits. H. D. James, assignor to Westinghouse Electric & Mfg. Co. Motor-driven regulator.

1,116,433. Controller for Induction Motors. H. D. James, assignor to Westinghouse Electric & Mfg. Co. Opening of main switch restores rotor-resistance controller to starting position.

1,116,437. Automatic Train Stop. E. M. Jones, assignor to Jones Signal System Co., Altanta, Ga. Includes electrically controlled air-brake valves.

1,116,440. Indicating Mechanism. C. F. Kettering, assignor to National Cash Register Co., Dayton, Ohio. Electric-light indicator for cash register.

1,116,442. Electric Toaster and Broiler. H. F. Kirkwood, Kineo, Me. Has a number of upright heating elements and a carrier for food arranged to be moved between the elements.

1,116,443. Atomizing Fan or the Like. J. I. Kopperl, Chicago, Ill., assignor of one-half to C. F. Eiker. Motor-driven fan and pump.

1,116,447. Electrical System. C. D. Lanning, Boston, Mass. Telephone repeater with a number of microphones in parallel.

1,116,450. Manufacturing of Metallic Filaments for Electric Lamps. A. Lederer, assignor to Westinghouse Lamp Co. Carbon is removed from tungsten filaments by heating them in an atmosphere of pure dry hydrogen.

1,116,453. Synchronizing Apparatus. S. Lubin, Philadelphia, Pa. For electrically synchronizing a motion-picture machine and a phonograph.

1,116,455. Electrical Measuring Instrument. P. MacGahan, assignor to Westinghouse Electric & Mfg. Co. Special stop and flexible connection between pointer and moving coil.

1,116,456. Line Clip. J. H. Mackrell, Butler, Pa., assignor of one-half to M. B. Snow. Formed from a single length of wire with a hold-fast device

1,116,458. Fire-Alarm System. M. Matos, Lorain, Ohio, assignor of one-half to M. Ostronjai. Firing of an explosive member closes alarm circuit.

1,116,466. Liquid-Weighing Mechanism. T. F. Mulligan, assignor to S. F. Bowser & Co., Fort Wayne, Ind. Electrical means for shutting the faucet and opening the circuit of the pump motor.

1,116,472. Alternating-Current Electric Meter. G. North, assignor to Westinghouse Electric & Mfg. Co. Motor meter with special pole construction.

1,116,475. Circuit Breaker. T. S. Perkins, assignor to Westinghouse Electric & Mfg. Co. Relates to laminated contacts.

1,116,477. Safety Device for Electric Circuits. O. Peterson, De Kalb, and H. C. Smith, Geneva, Ill. Low-tension circuit-breaker.

1,116,480. Electric Vapor Arc Lamp. E. Podszus, Rixdorf, Germany. Electrodes joined by a tubular refractory body adapted to emit light when heated to glowing temperature.

1,116,492. Brush Holder. A. N. Sammarone, Akron, Ohio. Special adjustment features.

1,116,504. Motor Controller. A. Simon, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. Oil transformer and drum-type switch mounted in same casing.

1,116,517. Automatic Time Switch. G. J. V. Greyn, Chicago, Ill. Clock-controlled means for releasing the switch.

1,116,522. Device for Suspending Trolley Wires, etc. W. H. Watts, Hamilton, Va. Hanger for use on messenger wires.

1,116,537. Signal Receiver. C. A. Bals, assignor to Frank B. Cook Co., Chicago, Ill. Telephone bell.

1,116,538 to 1,116,541. Telephone-Exchange System. M. L. Johnson, assignor to Frank B. Cook Co. Four patents covering semi-automatic telephone system in which the order to the operator may be recorded on a phonograph and reproduced.

1,116,542. Telephony. M. L. Johnson, assignor to Frank B. Cook Co. Special signaling system for above.

1,116,552. Motor-Starting Switch. C. H. Bissell, assignor to Crouse-Hinds Co., Syracuse, N. Y. For induction motor; has neutral starting and running positions.

1,116,561. Switch-Plug Lock. H. Butz, Albion, Ind. Notched locking disks hold the plug.

1,116,566. Electric Switch. R. H. Conrad, Oakland, Cal. Solenoid-controlled switch for three-phase motor.

1,116,584. Spark Plug. E. C. Gingrich, Toulon, Ill. Includes a valve.

1,116,586. Electric Sadiron. W. S. Hadaway, Jr., assignor to Westinghouse Electric & Mfg. Co. Has metal-clad resistance element and a body of metal having relatively low melting point which is poured around the element.

1,116,588. Receiver for Wireless Communication. W. Harrison, Brooklyn, N. Y. Includes a number of antennas

spaced apart by distances of half a wave length.

1,116,591. Telegraph Repeating System. A. T. Jester, Houston, Texas. Special electromagnetic repeater.

1,116,595. Incandescent Lamp. A. S. Knight, assignor to Westinghouse Lamp Co. Has W-shaped filament.

1,116,598. Annunciator. O. M. Leich, assignor to Cracraft, Leich Electric Co., Genoa, Ill. Drop for magneto telephone switchboard.

1,116,606. Electrical Apparatus for Effecting the Chemical Combination of Gases. C. C. Meigs, Charleston, S. C. Concentric shells with electrodes.

1,116,607. Protective Device for Electrical Circuits. G. Moore, Frankfort, Ind. Combined fuse block and lightning arrester.

1,116,619. Illuminated Speedometer Indicator. J. Parkinson, Los Angeles, Cal. Incandescent lamp with color screens controlled by speed of automobile.

1,116,631. Insulator. F. J. Schisler, Winthrop, Minn. Has wire-receiving slot with tongues across the top. (See cut.)

1,116,652. Trolley Head. C. W. Warner, Vancouver, B. C., Canada. Has a cylindrical roller mounted on each side of the head to engage guide wires.

1,116,655. Spark Plug. H. F. Whalton, Key West, Fla. Covers details.

1,116,657. Printing Telegraph. C. J. Wiley, Yorktown, N. Y. A single tape runs through all the instruments.

1,116,661. Treatment of Gases. E. R. Wolcott, Chicago, Ill. Some of the chambers contain electric heaters.

1,116,667. Telephone Cutout. J. Anderson, Jr., Omaha, Neb. Push-button device for desk set.

1,116,705. Electromotor. B. F. Hutches, Jr., Allendale, N. J. Has rotating aramture surrounding stationary field.

1,116,763. System of Automatic Block Signaling. F. Townsend, New York, N. Y., assignor to General Railway Signal Co. A. C. signaling for D. C. electric railway.

1,116,772. Apparatus for Treating Metals. S. T. Wellman, Cleveland, Ohio. Electric reduction furnace.

1,116,818. Storage Battery. F. M. Holmes, assignor to L. W. Thorp, Springfield, Mo. Each plate is in a separate compartment.

1,116,847. Trouble Lamp. T. F. Russell, assignor to F. V. Russell, Newtonville, Mass. Has handle, thumb piece and clamping jaws.

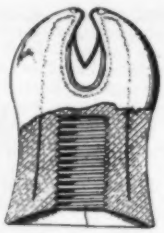
1,116,855. Electric Heater. E. A. Sperry, Brooklyn, N. Y. Double fluid heater of convection type.

1,116,865. Process of Producing Alkali and Alkaline-Earth Metals. C. E. Acker, Ossining, N. Y., assignor to Nitrogen Co. Comprises electrolyzing a fused cyanogen compound.

1,116,870. Controlling from a Distant Point the Operation of a Mechanism or Instrument. C. Berger, Budapest, Austria-Hungary, assignor to Submarine Wireless Co. Electric acoustic mechanism for operating toys, illuminating and igniting devices, house telegraphs and the like.

1,116,871. Method and Means for Reducing Sparking in Electrical Apparatus. D. M. Bliss, assignor to Thomas A. Edison, Inc., West Orange, N. J. Consists in spraying a vaporizable conducting liquid upon the commutator segments.

1,116,883. Electric System for Automobiles. E. A. Halbleib, assignor to North East Electric Co., Rochester, N. Y. Three-wire system; includes differentially wound generator, storage battery and resistance.



1,116,631.—Insulator.

1,116,884. Electric Furnace. W. H. Hampton, assignor to Conley Electric Furnace Co., Wilmington, Del. Shaft type.

1,116,893. Safety Device for Secondary Cells. M. R. Hutchinson, assignor to Edison Storage Battery Co., West Orange, N. J. Fluid-containing means for extinguishing the flame of an internal explosion in the cell.

1,116,933. Machine for Forming Electric Conducting Coils. F. B. Segur, Chicago, Ill. Covers details of mechanism.

1,116,949. Telegraphic Photography. C. Stille, Friedenau, near Berlin, Germany. Selenium cell in circuit.

1,116,951. Process of Electrical Separation. H. M. Sutton, W. L. Steele and E. G. Steele, Dallas, Texas. Consists in subjecting the material to electric charges convectively delivered in its path.

1,116,952. Starting Box. M. Taigman, New York, N. Y. Special mounting of resistance terminal buttons and binding-posts in insulating panel.

1,116,960. Metallic Electrode. E. Weintraub, assignor to General Electric Co. Mercury-vapor tube with tungsten anodes kept relatively cool.

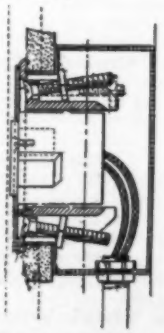
1,117,006. Cup-Post for Electric Batteries. J. A. Doran, Providence, R. I. Combined electrode cap and terminal.

1,117,042. Train Stopping and Signaling System. L. C. Hansen, Liberty, Sask., Canada. Electric block-signal system with motor-operated signals.

1,117,046. Electric Switch. C. Hill, Geneva, Ohio. Includes a bowed operating plate.

1,117,059. Machine for Sealing Supporting Wires Into the Beads of Glass Rods of Metal-Filament Electric Incandescent Lamps. J. Kremenezky and J. Jellinek, assignors to firm of Johann Kremenezky, Vienna, Austria-Hungary. Covers details of mechanism.

1,117,084. Attachment for Conduit Outlet Boxes. J. C. Phelps, Springfield, Mass. Extension ring secured to neck of box. (See cut.)



1,117,084.—Outlet-Box Extension.

1,117,120. Electromagnetic Device for Operating Typewriters. G. A. Wikander, Portland, Oregon. Key-controlled.

1,117,131. Lamp Shade. W. R. Green, assignor to Wallace Novelty Co., New York, N. Y. Clamped to lamp bulb.

1,117,140. Portable Electrically Driven Tool. J. A. Osborn, St. Louis, Mo. Drill or the like.

1,117,144. Speed Indicator for Continuous or Alterating-Current Motors. M. C. A. Latour, assignor to General Electric Co. The indicator is actuated by a combined flux due to voltage and current of motor.

Patents Expired.

The following United States electrical patents expired November 16, 1914.

593,559. Storage Battery. E. A. Barker, Watertown, N. Y.

593,571. Magnetic Clutch. T. J. Fay, Brooklyn, N. Y.

593,611. Multiple-Switchboard System for Telephone Exchanges. C. E. Scribner, Chicago, Ill.

593,612. Toll-Counter for Telephones. C. E. Scribner.

593,613. Polarized Signal-Bell. C. E. Scribner.

593,614. Telephone System. C. E. Scribner.

593,625. Insulated Hanger. E. P. Warner, Chicago, Ill.

593,626. Electric Lamp. E. P. Warner.

593,627. Telephone. J. Weil, Mansfield, O.

593,692. Electric Signaling Mechanism. L. G. Rowand, Camden, N. J.

593,697. Electric Arc Lamp. C. C. Stirling, Hartford, Conn.

593,716. Alternating-Current Motor. A. J. Churchward, Brooklyn, N. Y.

593,718. Electricially Driven Gas Machine. Thomas J. Fay, Brooklyn, N. Y.

593,720. Telephone Toll Station. W. Gray, Hartford, Conn.

593,738. Electric Arc Lamp. W. H. Coughlin, Worcester, Mass.

593,803. Electric Battery. W. W. Hanscom and A. Hough, San Francisco, Cal.

593,817. Rheostat. G. J. Schneider, Detroit, Mich.

593,819. Telephone and Signaling or Calling System. J. G. Smith, New York, N. Y.

593,820. Electric Signaling or Calling System. J. G. Smith.

593,832. Electric Brake for Elevators. J. P. Casey, Bloomsburg, Pa.

593,852. Multiple Metering of Electric Currents. E. Oxley, Washington, D. C.

593,853. Electric Cutout. H. T. Paiste, Philadelphia, Pa,

593,858. Indicator for Electrical Measurements. E. B. Rosa, Middletown, Conn.

593,884. Electric Announciator. J. A. Gowans, Stratford, Canada.

593,899. Electric Arc Lamp. G. R. Lean, Cleveland, O.

593,914. Electric Switch. W. M. T. Weise, Davenport, Iowa.

593,919. Electrical Switchboard for Coin-Operated Machines. J. L. Blodgett, Los Angeles, Cal.

593,965. Coupling for Electric Circuits in Railway Trains. J. Merryweather, Greencastle, Ind.